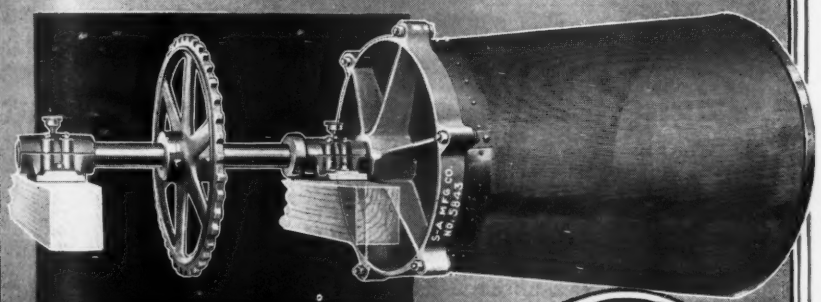
Pit and Quarry

SAND ▪ GRAVEL ▪ STONE

HANDLING ▪ CRUSHING ▪ SCREENING ▪ WASHING

S-A GILBERT SCREEN



PRODUCT THOROUGHLY WASHED AND SIZED

Aggregate is delivered to extreme inside of screen and tumbles its way to the open end against jets of water.

Write for sizes and capacities

STEPHENS-ADAMSON MFG. CO. Aurora, Ill.

January 15, 1925

Index to Advertisers - - Page 31
Table of Contents - - - - Page 33

Circulation 7,600

Designed to Work—Built to Overwork

If you have a real tough haulage job in a pit, quarry, or on a construction contract—give it to a "Whitcomb."

Every Whitcomb Locomotive does all that its rating promises—and more, for Whitcomb construction means not only a mechanically good machine, but it means oversize parts, "oversize" capacity, and an extra measure of real, dependable service.

Whitcomb Locomotives have earned the difference between profit and loss for many pit and quarry operators, because they transport material cheaper, quicker, and regularly. Whitcomb dependability is proverbial. Whitcomb economy is undisputed.

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GEO. D. WHITCOMB COMPANY
ROCHELLE, ILLINOIS
Offices in principal cities.

GASOLINE-STORAGE BATTERY-ELECTRIC
WHITCOMB
LOCOMOTIVES

Pit and Quarry

A Semi-Monthly Publication for Producers and Manufacturers of Sand, Gravel, Stone, Cement, Gypsum, Lime and Other Non-Metallic Minerals.

VOL. 9 CHICAGO, ILL., JANUARY 15, 1925 NO. 8

CONTENTS

The Goodwill of Employees..... 35
Appropriation for Commerce Commission..... 36
The 1925 Hand Book..... 36
The New Departure in Rock Asphalt Production..... 37
Portland Cement Statistics for December..... 44
The National Crushed Stone Convention..... 45
The 1925 Outlook for Liming Materials..... 48
The American Road Builders' Convention..... 53
The Mineral Products Crushing Units..... 59
The Disposal of Stone Screenings..... 62
The National Sand and Gravel Convention..... 67
Cement Products Standardized..... 74
Concrete Products More Popular..... 74
Standardizing Concrete Block..... 74
The Profit and Loss Statement..... 75
Federal Roads and Buildings..... 77
Standardizing California's Minerals..... 78
Making Marble Concrete Aggregate..... 79
The Economics of Rate Making..... 83
The New Year at Memphis..... 87
Thogmartin and Gardiner Producing Gravel..... 89
New Slag Crushing Plant Contemplated..... 90
Southern Illinois Limestone Company Builds..... 91
New Incorporations 92
Financial Basis of State Highway Program..... 93
Trade Notes, Catalogs, New Equipment.....97, 100

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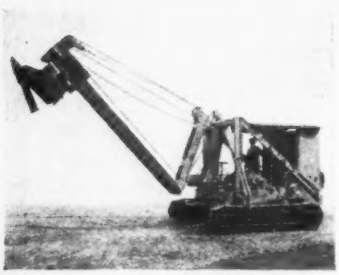

The "Bear Cat" with skimmer attachment is a fast and powerful digger. Note the high swing and bottom dump bucket, tripped from the cab and locked automatically.

You Never Saw Its Like

An all-purpose light crane mounted on full caterpillars, with a 40 h.p. gasoline engine, handling seven interchangeable attachments, and operated by one man—did you ever see a machine that would answer such a description? Not unless you have seen the "Bear Cat".

This wonderful machine is fast as well as powerful. It handles materials with a half-yard clamshell bucket at the rate of three or four round trips a minute. With the skimmer attachment it digs and loads with a rapidity that will surprise you, no ground man being needed for its operation, as the bucket is tripped from the cab. Just figure what a saving that means.

Other attachments furnished for use with the "Bear Cat" include dipper shovel, dragline, backfiller and ditcher. The exceptionally rugged steel construction of the machine enables it to withstand the strain of hard and constant service.

Send for our big new Catalog with illustrations and complete description.

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310 Sycamore St. **Ravenna, Ohio**

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BYERS CRANES

THE "BEAR CAT"

Pit and Quarry

Vol. 9 Chicago, Ill., January 15, 1925 No. 8

The Goodwill of Employees

EMPLOYERS are coming more and more to realize that the spirit of the organization is a subtle and important factor for success. The most competent workman becomes a far better workman when he works with enthusiasm and loyalty. Employers are to a large degree dependent upon the efforts of the workers; efforts that cannot be secured with a maximum efficiency by force. This fact has led wise employers to establish the custom of holding conferences with their employees. Heads of departments, foremen, minor subordinates are brought together for discussion of problems pertaining to the policies of the organization. Their achievements and efforts are thus commented upon; their suggestions are heard; many a difficulty is ironed out before it has grown to any proportions that might result in unpleasant results. The best expression that we have borrowed from the French is "Esprit de Corps." The Spirit of the organization is the key to its success.

In some cases these conferences have been called "Round Table" discussions. The expression, borrowed from the well known King Arthur stories, is significant. At a round table there is no head; there is no opportunity for indicating rank. All are the same distance from the center; all are for the time equal and can be heard.. The effect of such democratic exchange of ideas is so important in establishing a feeling of cooperation and good will that the results are certain to show in numerous and practical ways.

There is a possibility that out of such meetings may come suggestions of inestimable value to the employer. There are many cases which might be cited of suggestions, inventions, ideas that are valuable and practicable that have come from the men in the ranks. The minor executives are nearer to the body of employees than are the executives; very frequently they have their confidence and gain from them information that is important to the manager or owner. Employers cannot be too well informed regarding their business; they cannot have too great harmony and good will. The employer who is indifferent to the opinions of any member of his organization, who is sufficient unto himself, is almost certain to lose much that might be of value to him. True, he will never know that he has missed it, and hence cannot estimate his loss.

A spirit of loyalty permeating through an organization is likely to increase the profits of that organization. A satisfied and enthusiastic person is a far better worker than a moody, disloyal individual. If the employer has the confidence of his minor executives and they in turn have the confidence of the rank and file of employees, it is almost impossible for any force to disrupt the organization. And such employees will increase the earnings of the business. A foreman is more likely to bridge the gap between himself and the lowliest worker if the gap between himself and his superior has been bridged. Ability to give orders or to maintain discipline through sheer force is not the test of an executive. Getting results is the crucial test, and getting results is usually voiced in terms of dollars and cents. Each day's output is the measure of the business. Workers who feel a certain interest in the organization for which they work will turn out enough more work in a day to warrant any effort on the part of the executives to instill in the employees this feeling that their employer's interest is their interest; that they can express opinions and be heard; that a stable relation of friendship exists between them and their superiors. Thus with the removal of all friction a business is certain to expand to the satisfaction of all who are a part of it. In the course of a year with this spirit of co-operation the stockholders will have occasion to wonder what has happened.

Appropriation for Commerce Commission

THE reduction of the appropriation for the Interstate Commerce Commission by the Bureau of the Budget is a matter of serious concern both to the railroads and to the shippers. The amount which the Commission estimates as necessary for successful functioning in 1925 is $7,364,496, while the amount appropriated is $4,913,500. So large a cut is certain to result in a hampering of the Commission's work to an extent that appears alarming to those vitally interested in transportation. A protest has come from railroads and shippers from all parts of the country.

On November 19th the National Industrial Traffic League at its meeting in New York appointed a committee to confer with the authorities in Washington and to put before them the urgency of providing necessary funds for the work of the Commission for the coming year. The opinion of the league is pertinent, since it is a conservative organization and not likely to have taken such action without ample justification. The opinion of the league is that this reduction of the appropriation of the Commission will result in the dismissal of a number of its employees. Obviously this will interfere with the work of the Commission.

It is thought that the valuation work of the Commission will be retarded, as undoubtedly some of the examiners will be dismissed in order to cut expenses. The result of such a situation will be that the hearing of complaints will be at Washington instead of at points more convenient to those concerned with the complaints. This will necessitate a delay in adjustments, a situation tending to defeat the ends of justice and the fundamental purpose of the Commission.

No one concerned questions the value of the work of the Commission. Since the Transportation Act of 1920 its activities have increased with amazing rapidity. These activities have proved to be vital to public welfare. The Commission has a tremendous work to do and cannot accomplish its work adequately if it is to be hampered so greatly. The intention of the Bureau of the Budget is commendable; the results of this particular piece of economy, however, appear to be disastrous.

The 1925 Handbook

THE 1925 edition of the PIT AND QUARRY HANDBOOK is now on the press and copies will be ready for distribution the first of February. The new edition will be a much larger and more complete book. Several new sections have been added. Changes and additions have been made in other sections which will bring the book up-to-date. The revision and additions have been directly along the line of numerous suggestions received from users of the book.

A new section on Cost Accounting by D. J. Hutchinson has been added. This section should prove helpful to many producers. A cost accounting procedure is given along with some forms. This section is written in a flexible manner and the recommendations given may be adjusted to meet individual conditions. Another new section has been added on Insurance by Dwight Ingram. Many valuable facts are included in these pages and arranged in such a manner as to be of valuable assistance to the person concerned with any problem of insurance affecting his business.

A Power Plant section has also been added. This section was prepared by Charles Longenecker, who has presented some valuable data in his articles which have appeared recently in PIT AND QUARRY. The numerous requests for the preparation of such a section as this assures its value. There will also be a new section on Speed Reducers as a result of many inquiries.

A new section on Shipping Data will be found in the new handbook. This section has been arranged to afford the greatest ease for reference. All the information that the operator will have immediate need for concerning freight rates, car demurrage, minimum weight, free time, bunching, etc., will be found in the pages devoted to Shipping Data. Mr. J. H. Donnell, who is well known to our readers, has prepared this material.

The Useful Data section has been enlarged to include data and tables of help to the producer. The new matter occupies about one hundred pages. The foremost thought in the preparation of the 1925 Handbook was to save the time of the busy producer.

An Interesting Departure in Rock Asphalt Production

The Crown Rock Asphalt Company Leads in a New Field Prepared Rock Asphalt for Rock and Street Pavements

EARLY in the year 1923 the Crown Rock Asphalt Company, financed by a group of Cincinnati capitalists, secured a large acreage of very desirable rock asphalt lands near Big Clifty, Grayson County, Kentucky, and installed a plant to produce ground Kentucky rock asphalt in the usual way. The original procedure followed by them was the same as that of the other companies then operating in Kentucky. The blasted rock is graded by "sorters" who, guided by the eye alone, mix the "lean" with the "fat" rock in such proportions as to obtain as nearly as possible a product containing 7% bitumen—this being the amount usually specified by the several States using rock asphalt extensively. The graded rock is then crushed, ground and shipped without anything further being done to it other than analyzing a sample from each car to ascertain if the grade is sufficiently high.

After operating in this manner for a short period the officials of the company came to an appreciation of three salient facts:

First—That in order to secure a product containing 7% bitumen it was necessary to discard as waste a large quantity of rock running around 5% bitumen and while this wastage is usual in rock asphalt production, it is expensive.

Second—That the most expert sorters or graders, guided by the eye alone, cannot tell the bitumen content closer than within one percent and therefore no real uniformity could be secured.

Third—That while the bitumen content may be above 7% its consistency and physical qualities vary in the rock from one area from that in the rock from an adjoining area and hence the resulting pavement was variable.

The next step was to determine if this expensive wastage could be eliminated, a true uniformity secured by chemical control and a product obtained by some method of treating or preparing that would be superior to the natural rock asphalt. With this in view, operations were suspended and an exhaustive series of experi-

An Underground Mine View

ments were made by an experienced testing engineer.

The results of the experiments having demonstrated that all of the conditions desired could be obtained, the company commenced in July, 1924, the erection of a plant for treating or preparing rock asphalt. While it was not completed and production started until near the close of the street building season, the several hundred tons which were made, shipped and laid, have entirely proven the success of both the product and the plant.

As the operations of this company involve two features not found in those of any other rock asphalt company operating at present in Kentucky, i.e., obtaining the rock by underground mining methods instead of quarrying and treating the rock after grinding, a description of their procedure should be of general interest.

The rock asphalt seam being operated is a bitumen impregnated stratum of the Chester Sandstone. It outcrops in a ravine about 90 feet below the general plateau level and as far as it has been penetrated shows an average of about six feet in thickness. The indications are that it will thicken as the workings are driven under the hill. The entire seam averages approximately 5.65% bitumen and the mineral aggregate is a very sharp, hard and well graded silica sand analyzing 98.27% silica.

The main entries are carried 20 feet wide and the room and pillar system common in coal mining is employed. Drilling is done with Chicago Pneumatic rotator drills using auger steel drill bits. The rock shoots well into "one man lumps," the best explosive for the purpose being Monobel. The blasted rock is hoisted from the mine to the rock-hopper up a 30 degree incline in end dump cars hauled by an electric hoist. Du Pont blasting powder is used.

A Webster reciprocating-plate feeder operates between the hopper and the first crusher which is a Williams hammer mill reducing the mine-run to 2 1/2" lumps. This product falls on an inclined belt conveyor which carries it to the finishing mill, also a Williams, where it is reduced to a coarse meal, 76% of which will pass a 1/4 inch screen. Both of these mills are driven at 1200 R. P. M. by direct-connected motors of 50 and 60 H. P. respectively.

The product from the second mill drops into a Webster V-Bucket conveyor which elevates it to the top of the three 50 ton compartment crushed rock bin, dropping it into any compartment desired. The product is automatically sampled as it leaves the second mill, all of that cut out while each 50 ton compartment is filling being considered a "batch sample." This is quartered down by the "sampler" and taken to the laboratory for analysis. In the meantime, while any given "batch sample" is being analyzed the ground rock for treating is

A Yard View Showing Crane Piling

drawn from a second compartment which has already been sampled and analyzed and the third compartment is being filled.

The "rock meal" for treatment falls from the apron of the bin on to an inclined belt conveyor which elevates it to the hopper of the screw feeder through which it enters the heater. The rate of feed to the heater is controlled by slide gates in the bottom of the hopper. The heater is of the cylindrical drum type, 4 feet in diameter and 14 feet long. It is direct fired by an oil burner at the discharge end and in passing through the temperature of the rock-meal is raised to 180 to 200 degrees Fahrenheit.

Upon leaving the heater the hot material drops into a weigh-hopper above the mixer and as soon as the scales indicate a charge of one ton it is discharged into the constantly revolving mixer below. This mixer is of the double shaft and blade type with bottom discharge gate operated by steam.

Dumping Onto Pile Storage

As soon as the one ton charge has entered the mixer the exact amount of "asphalt cement" required to bring the rock up to the desired percent of bitumen is added. This amount is determined by the chemist from his analysis of the rock and a knowledge of the bitumen content of the asphalt cement and is given to the mixer operator for each 50 ton batch.

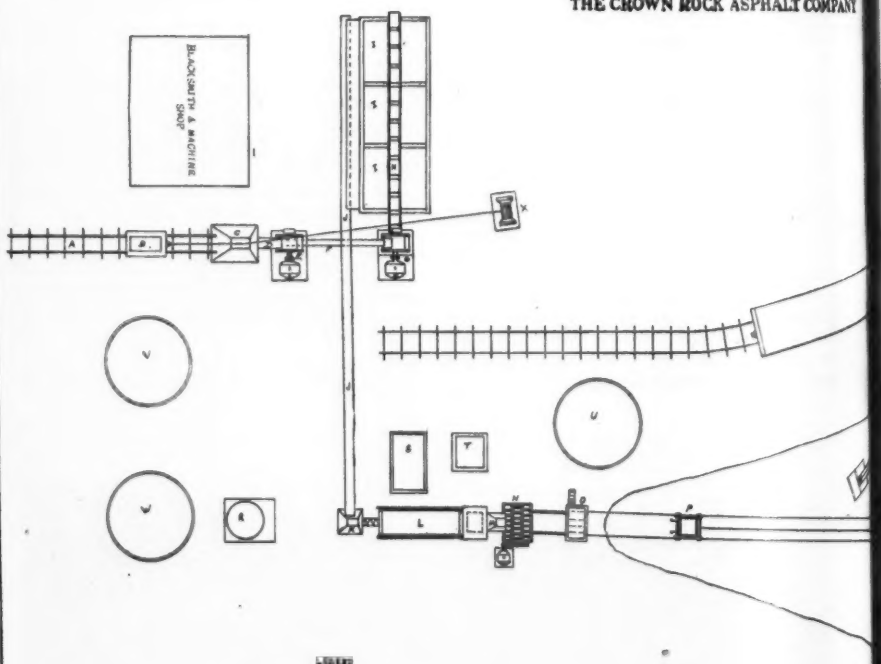
The asphalt cement is composed of Trinidad Lake asphalt fluxed with Mexican asphalt and is of a predetermined consistency or penetration and thereon depends the superiority of the prepared over the natural or untreated rock asphalt. It has long been known that the bitumen in rock asphalt is a "maltha" rather than a true asphalt and that while it has given wonderful service in many cases under severe conditions, it would be even better if the contained bitumen was slightly harder or, in technical phraseology, "of a lower degree of penetration." This point is attained by deliberately grinding the rock a little below the required percentage and bringing it up to slightly above it by the addition of a bitumen

General View of Shipping Facilities

or asphalt somewhat harder than that naturally contained. The exact consistency the asphalt cement should have is determined by physical tests in the laboratory. These tests on the crude rock as well as the finished product are laboratory routine the same as the determination of the bitumen content. It is obvious, therefore, that all variations in both the "richness" and the "softness" of the natural rock are overcome by scientific methods, and the finished product kept uniform from both the chemical and physical standpoints. In fact, for the first time in the history of Kentucky rock asphalt it has been placed on a basis comparable in every way to the cement, steel and rubber industries.

While the company turns out a product having a bitumen content above the standard specifications they do not use this incomplete test as a criterion of the suitability of the product for paving purposes. Instead they use the physical tests of Penetration and Compression and require that their finished product stand up to a point much higher than that reached by the best grades of untreated natural rock asphalt. In the

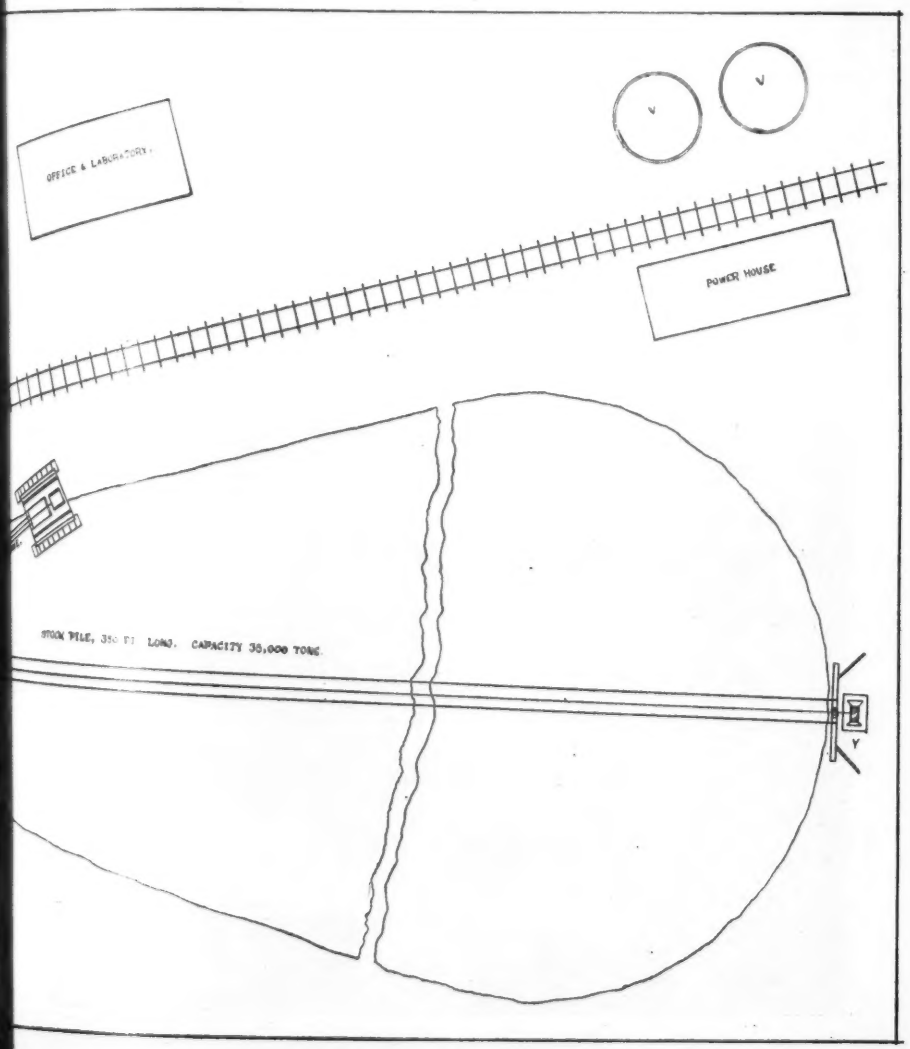
PLANT—LAYOUT
OF
THE CROWN ROCK ASPHALT COMPANY



preliminary research work comparative tests were made for Indentation, Tensile Strength and Wearing-away as well as Penetration and Compression and it was found that the prepared product greatly excelled in every case, frequently as much as 200% to 300%, but the Penetration and Compression Tests were, upon the advise of the highest authorities, adopted as the ones "telling the story" the best.

For the purpose of testing this company's finished product as well as natural rock asphalts, a combination machine shown in line drawings herewith, has been evolved This machine is used for the triple purpose of making the briquettes for testing in such a manner that all of them receive the same compaction and performing the penetration and compression tests. The methods by which the briquettes are made and the tests performed are as follows.

The briquettes are made by use of the briquette machine under the following conditions: A sufficient quantity of the material to make a cylindrical briquette 1 1/4 inches in diameter and one inch in thickness is placed in a cylindrical mould 1 1/4



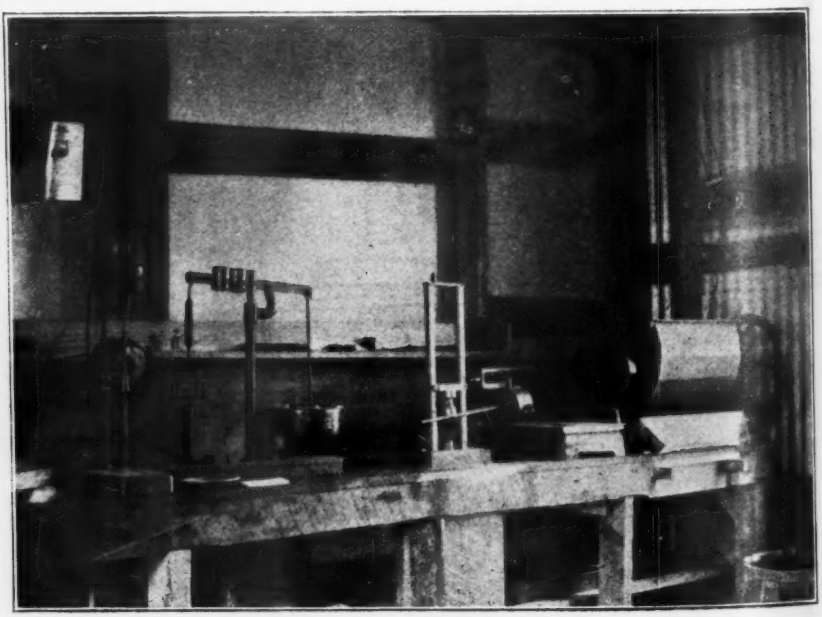
inches in diameter and 3 1/2 inches long, open at both ends. The lower one inch of this cylinder is occupied by a boss attached to the base. After the material is placed in the mould, a solid cylindrical plunger 2 1/2 inches long and of the proper diameter to fit the mould is inserted, thus confining the material between the upper face of the boss and the lower face of the plunger. A five kilo weight or hammer held in position by the uprights is allowed to drop a distance of ten inches, ten times on the upper end of the plunger. The mould is then removed from over the boss, inverted, the plunger placed in the opposite end, the mould replaced over the boss and ten blows delivered to the opposite end of the briquette, thus obtaining uniform compression. The temperature of the material shall not exceed 85 degrees Fahrenheit while the briquettes are being made.

The penetration test is made by noting the time it requires the five kilo weight to force the blunt end of a steel rod five millimeters in diameter to a depth of five millimeters into the briquettes made as described above and confined, while being tested, in the cylindrical mould, the lower 2½ inches of which is occupied by the plunger, thus making the upper face of the briquette flush with the end of the mould. This penetration shall require a minimum of twenty seconds at a temperature not lower than 75 degrees Fahrenheit and the average of at least five tests being taken.

The compression test is made by noting the time it requires a weight or equivalent force of fifteen kilos to uniformly compress and unconfined briquettes, made as described above, from one inch to three-quarters of an inch in thickness. This compression shall require a minimum of forty seconds when tested at not lower than 75 degrees Fahrenheit and shall be the average of at least five tests taken.

It should be said that although the finished pavement is stiffer and more resistant to destruction by traffic than the unprepared rock asphalt, yet it does not set up more than the natural rock, is handled as easily and laid cold in the usual manner.

To conclude, the description of the plant it should be said that the finished product leaving the mixer drops into a bottom discharge bucket which conveys it directly to the cars for shipment or to the stockpile for storage during the winter months. This stock-pile is 350 feet long and has a capacity of 35,000 tons. When the laying season opens the material is reclaimed from the stock pile by an



A Corner of the Testing Laboratory

Austin caterpillar crane and clamshell.

All of the machinery of the plant as well as the air compressors is driven by individual motors, power being furnished by a 150 H.P. Fairbanks-Morse fuel oil engine directly connected to a 100 K.W., D.C. generator. The steam for melting and keeping the asphalt cement hot, operating the mixer discharge and other minor purposes is furnished by a 30 H.P. oil fired boiler.

To the perseverance and foresight of Mr. Charlton Wilder, the President of the Company, belongs the credit of placing it on a sound and successful business basis and to Mr. W. C. West, the Chief Engineer, belongs that of developing the process used and designing and erecting the efficient plant.

The Shawnee Stone Company, a Delaware corporation. recently qualified to quarry and deal in stone in Indiana, with capital of $100,000 (in that state). Agent, John L. Torphy, Bloomington.

The strong banking situation will sustain an expansion of business. It is even possible that money will be cheaper. There certainly are not any present indications of tension in the money market that might hamper business. Bankers are painfully aware that deposits have increased above last years figures.

Hardinge Air Classifiers

Bulletin No. 17, describing the Hardinge Rotary and the combined Hardinge Rotary and Superfine Air Classifiers, for use with the Hardinge Conical Mill, has just been issued.

Hardinge Air Classifiers have been developed to meet the general demand for fine, dry grinding and to eliminate auxiliary apparatus heretofore required when a fine dry product has been desired. This air classifier can be attached to any Hardinge mill now operating, providing clear space is available in front of the discharge. It is capable of producing a product of approximately 98 per cent passing 48 mesh and 80 per cent passing 200 mesh, or coarser if desired, when grinding such materials as limestone, feldspar, silica and coal.

Chicago Pneumatic Service

The Smith and Woodbury Company, 55 Grand Street, Portland, Oregon, have been appointed distributors for Oregon and Southwest Washington by the Chicago Pneumatic Tool Company. They will stock a complete line of pneumatic and electric tools, rock drills, air compressors, and semi-diesel oil engines to meet the requirements of the territory covered by this arrangement. They will also maintain an up-to-date service department in Portland.

View from Rear of Plant

Portland Cement Statistics September, 1924

THE following tables, prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on the reports of producers of Portland cement. The December, 1924, totals include estimates for two plants. December production shows an increase and shipments a decrease as compared with 1923; stocks are the greatest at the end of any year recorded by the Survey; the preliminary totals for 1924 show increases of 8.3 and 7.2 per cent respectively for production and shipments over the final totals for 1923, thus making new high records.

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in November, 1924, amounted to 198,806 barrels, valued at $305,598. The total imports in 1923 amounted to 1,678,636 barrels, valued at $2,964,098.

The imports in November were from Belgium, 87,187 barrels; Norway, 77,268 barrels; Denmark, 26,022 barrels; Canada, 3,265 barrels; England, 2,091 barrels; other countries, 2,973 barrels.

Production and shipments of finished portland cement, by districts in December, 1923 and 1924

Commercial District	Production, December		Shipments, December	
	1923	1924	1923	1924
Eastern Pa., N. J. and Md.	2,553,000	2,883,000	1,951,000	1,606,000
New York	557,000	565,000	402,000	283,000
Ohio, Western Pa. and W. Va.	930,000	898,000	463,000	346,000
Mich.	536,000	491,000	295,000	182,000
Wis., Ill., Ind. and Ky.	1,444,000	1,519,000	687,000	527,000
Va., Tenn., Ala. and Ga.	708,000	947,000	550,000	792,000
Eastern Mo., Ia., Minn. and S. Dak.	1,018,000	953,000	374,000	263,000
Western Mo., Neb., Kan. and Okla.	734,000	705,000	411,000	315,000
Texas	227,000	372,000	187,000	258,000
Colo. and Utah	133,000	138,000	90,000	63,000
California	965,000	879,000	889,000	774,000
Ore., Wash. and Mont.	192,000	85,000	109,000	97,000
	9,997,000	10,435,000	6,408,000	5,506,000

Stocks of clinker, or unground cement, at the mills at the end of December, 1924 amounted to about 5,401,000 barrels compared with 4,025,000 barrels (revised) at the beginning of the month.

Production and shipments of finished portland cement, by months, in 1923 and 1924, in barrels.

Month	Production		Shipments	
	1923	1924	1923	1924
January	7,990,000	8,788,000	5,628,000	5,210,000
February	8,210,000	8,588,000	6,090,000	5,933,000
March	9,880,000	10,370,000	10,326,000	8,995,000
First quarter	26,080,000	27,746,000	22,044,000	20,138,000
April	11,359,000	11,726,000	12,954,000	12,771,000
May	12,910,000	13,777,000	14,257,000	14,551,000
June	12,382,000	13,538,000	13,307,000	15,036,000
Second quarter	36,651,000	39,041,000	40,518,000	42,358,000
July	12,620,000	14,029,000	13,712,000	16,614,000
August	12,967,000	15,128,000	14,971,000	16,855,000
September	13,109,000	14,519,000	13,698,000	16,827,000
Third quarter	38,696,000	43,676,000	42,381,000	50,296,000
October	13,350,000	14,820,000	14,285,000	17,160,000
November	12,603,000	13,141,000	10,251,000	10,289,000
December	9,997,000	10,435,000	6,408,000	5,506,000
Fourth quarter	35,950,000	38,396,000	30,944,000	32,955,000
Preliminary total	137,377,000	148,859,000	135,887,000	145,747,000
Amount of under estimate	83,000	.....	25,000	.....
Final total	137,460,000	.....	135,912,000	.....

National Crushed Stone Association Holds Impressive Convention

Consider Research, Educational and Promotional Activities The Technical Group Meetings Develop Greater Cooperation

CINCINNATI was the scene of the most successful crushed stone convention ever held. This was the ninth annual convention, from January 12 through January 15 and was the most successful from practically every angle. The general sessions and the group sessions were unusually well attended. The speakers were all men of authority in their respective lines. The sessions were all conducted with clock work regularity. A larger number of ladies were present than had ever graced any previous convention. The entertainment features of the convention were beynod criticism of any sort.

The convention was divided into five general sessions, afternoon group sessions, manufacturers exhibit and entertainment. This does not account for the many little groups that gathered at every opportunity to discuss operating and production problems. The exchange of ideas at these various group gatherings, luncheons, private groups, etc., could not even be estimated.

President J. J. Sloan opened the convention on Monday morning at 10 o'clock. Judge Ryan welcomed the crushed stone producers and their guests in the absence of the mayor. Mr. John Rice responded on behalf of the National Crushed Stone Association. Mr. Sloan then gave his address. Every listener will have memories for some time to come of this stirring message. Mr. Sloan brought his listeners to their feet with his closing remarks.

Address of John J. Sloan

Yours is an honored and an honorable industry which—from the earliest times—has ever played a most important part in the welfare of human kind, and stone in one form or another, has been used, not only as a means of defense—but an aid in obstaining sustenance and shelter, and all through the affairs of life, until finally as a memorial used to perpetuate one's name and his fame.

I have no desire to exalt the crushed stone industry beyond its proper place in the affairs of life, but in all sincerity I submit that—were it to cease its activities tonight—civilization, as we know it, could not function; chaos and disorder would follow and isolation and primitiveness would result, —with their attending wretchedness and misery.

You can be very sure that we have no intention of permitting any such catastrophe to occur and the facts are stated only to draw attention to the basic character of the industry and to prove to a more or less heedless world, how essential we are to the well ordered system that governs our lives and interests.

You can abolish one kind of food and live on another; you can abolish your usual covering and—as your ancestors did—go clothed in fig leaves and furs; you can find a substitute for all present day materials we consider so essential, but you cannot carry on our present progressive civilization without crushed stone, for nature—with all her munificence—has not provided a substitute for it.

Truly—we live in an age of steel and that essential product cannot be successfully or profitably produced without us.

Truly—we live in an age when transportation required for the distribution of human energy, could not function without the crushed stone producer.

Second only in importance to others is the chemical industry which makes possible greatly increased food supply and ramifies through the whole range of manufacturing, even including that of medicine, and crushed stone in one form or another is absolutely essential either directly or indirectly.

Federal statistics indicate an investment of $260,000,000 in our industry, producing approximately 100,000,000 tons annually and furnishing direct employment to 200,000 persons.

The importance of the industry has grown with the year and it has been showing a steadily increasing output averaging about 10 per cent for the last few years. Its growth and vol-

ume have been such that—since the organization of the National Crushed Stone association—transportation companies and others have awakened to the measure of its importance, with the result that greater consideration—not only in tariffs, but in the movement of commodities and the equipment to handle same, have engaged their earnest attention—with the result that during the past year very few complaints relative to public carriers have been heard.

The organization of the Association dates from the dark and bloody days of the Great War when—in January 1917, in the City of Columbus, a handful of earnest, devoted operators gathered together to see what might be done toward enabling the industry to continue with the many restrictions, as well as demands, made by the necessity of war and—as I look back upon the efforts made by our former Presidents from Blair to Rice—and Rice to Krause—and Krause to Ames—and Ames to Schmidt, our last President, I am impressed with the thought and the energy that they each in turn expended in the development and bettering of the Association for the common interests of all and I take this opportunity of paying my tribute to them but by many others, representing scores of companies whose officers were all concerned in convention work, and I am satisfied that as they look back on it, they have the consciousness—not only of duty well performed—also of financial returns—by reason of the Association's efforts—that in the prosperity the industry has achieved, they have had their full measure of it.

That we have grown and that our importance has increased is evidenced by the organization of our Auxiliary Association of Manufacturers who provide us with the necessary equipment and enable us to meet present day demands and it is pleasing to acknowledge their very material help and assistance, as well as their displays of recent years which have been an education and source of knowledge to us all.

Lastly, the trade publications and their personnel who have been first and foremost in every effort to better and raise the industry to a higher standard—who by advice and kindly suggestion have aided in a higher standard and higher ethics amongst all producers and who—by the dissemination of information and knowledge—have kept all producers, whether members of the Association or not, fully advised as to what was going on, have been a tremendous factor of importance in our growth.

With their descriptions of technical devices; potential market values and prices, they have enabled comparable standards to be established the country over that in most instances have been of great value, and a direct guide to the policy of many producers, so that our thanks are in a special manner due to our various trade papers and their respective staffs, who deserve from the industry all the appreciation that you can bestow upon them.

During the past year your officers have diligently sought to protect and advance your interests in every way, especially in important matters of tariffs and their relation to other commodities. Members of the Rail road Committee have repeatedly attended sessions in Washington, where our requests and suggestions have been given most courteous consideration. Chairmen of many committees have diligently attended to their respective duties and the fruits of their work will be spread before you as our Convention goes on so that you may profit as a result of their efforts. Additional membership has been gained during the year and there is every prospect of increased membership during the coming year.

With a building program estimated by the F. W. Dodge Agency of over $5,000,000,000 to be spent in 1925, a road program in th evarious states, counties and municipalities well in excess of $2,000,000,000; with railroads contemplating the expenditure of another $1,000,000,000—due to the greatest freight movement in history; with the steel industry operating at 90 per cent capacity, the highest since war times; with the most prosperous farming communities that we have seen in the seven years past, with money more plentiful and the lowest interstates ever before in history; with a definite policy of government assured for the next four years; with a healthy and contented people and a world clamoring for many of the Nation's products, there is every reason to believe that 1925 should be one of the best and most prosperous years in history.

That the Crushed Stone Industry will share in this prosperity is fundamental due to the basis character of

our product and it only remains that we take counsel together, adopt the best and most economical methods of production, observe the standards and ethics of the trade and in producing our product according to the necessities and demands upon us, that we do it in a manner that shall be above criticism and that will give service and full value for whatever our charges are.

Separately each of us may go our way and possibly prosper—collectively and unitedly we stand as a force that will secure the attention and legislative bodies everywhere—of public agencies anywhere and—acting together we can defend ourselves against inimical legislation—protect our rights and insure the respect and attention of the people to any reasonable and just demands we may make.

Take part in all the various group meetings and sessions of this Convention for, in its last analysis, it is a post graduate course in your business and here—by direct contact, you have an opportunity to meet men of many minds, obtain the views and learn the standpoint of men who have made the industry a success and—although you spend thousands, with months of travel—you never could get the personal contact, the advice or knowledge or information that I am sure every member present will gladly extend to each other.

Organization today is a necessity in any line of industry, that is worthy of being called a business and—with no selfish interests to serve—we extend the hand of fellowship to all of you, trusting that your days here may be both pleasant and profitable and that our efforts to advance the welfare of the Association will meet with a hearty response from all of you for—in helping it to that extent you are only helping yourselves.

Governments come and go—officials are in and out of office—but industry on which men live goes on forever—and, it should be our endeavor to constantly seek for new blood and efficient blood, which can be trained and develpoed into assuming responsibilities, not only of our particular industry, but associations such as these, for—when your National Associations are well managed, with definite standards, and set a pace for progress and prosperity it becomes a guiding star to the men in that line and an inspiration as well as a protection for all concerned.

We want your aid and your advice and, particularly, we want your good will. We are but human, trying to do the best we know, and it will be a pleasure as the Convention carries on to have every member take a part and do his part so that the time we spend here will be of the greatest possible benefit to all of us.

Another interesting part of the Monday morning session was the reports from the individual directors concerning the outlook for 1925. Their reports were all optimistic with the possible exception of the reports concerning Wisconsin and Minnesota. Even these states expect to hold their own but there is an element of uncertainty concerning a better year. The increased earning power of the railroads will enable them to make more and better improvements. The recovery of the farm will aid the agricultural limestone producers. There is no reason to expect any car shortage. The possibilities of a greater commercial use of crushed stone products is not hard to visualize. In short all possible markets for crushed stone will be greater in 1925 and the allied industries that are necessary to support these markets are on a better foundation than in years. All the signs have been counted and found favorable.

The various group sessions were held in the afternoon starting with lunch on the first three days of the convention. These were groups to discuss agricultural lime and limestone, concrete aggregates, highway problems, ballast and sales problems. All the sessions were well attended and several sessions continued beyond the time planned because of the great interest of those present. The chairmen of these sessions deserve much credit because of the excellent character of their programs. It was very evident that months previous to the convention these chairmen had been at work arranging their programs.

Mr. E. M. Lamkin was chairman of the Agricultural Lime and Limestone Group that met on Monday. Mr. Towles, Manager Agricultural Limestone Department of the National Lime Association addressed this session on the future outlook of agricultural liming material. The discussion of Mr. Towles' address that followed showed an unusual interest in his remarks. Mr. Towles' address . is printed below. The general opinion expressed was that the farmer will

eventually demand finer material. A uniform national agricultural lime and limestone low was advocated.

The 1925 Outlook for Argicultural Liming Materials

At the meetings of the American Association for the Advancement of Science which were held in Washington a week or so ago, one of the speakers, a well known scientist in his particular line, made a statement to the effect that the development of scientific data in fields pertaining to certain industries has been more rapid than has been the growth of the particular industry effected. In other words, he claims that such science has outdistanced the capacity of the manufacturers to utilize it.

According to some figures which I have, there is in this country an actual need annually for the application of something over 50 millions of tons of soil liming materials, but less than 2 millions are applied. This does not mean that 48 more million tons is the maximum amount that our soils will carry, but it means that every ton of these 48 millions will, theoretically at least show an increase not only in tons of hay and bushels of grain, but in dollars of profit as well. How much the increased profit would be I do not know. The Director of the Maryland Experiment Station stated in an address that it would not be less than $5 per acre on some 40,000 farms in his state, which would be placing several millions more of dollars in the hands of farmers in even a little state like Maryland. A report of Indiana shows the average from a large number of liming tests to be nearly $7 per acre in increased profit. Virginia shows the increased profit from liming to be more than 100 per cent per rotation. Alabama shows that 6 years after lime was used it was still increasing the seed cotton crop over $14 per acre. Ohio reports a profit of $20 per acre per rotation, Kentucky reports an annual increased profit of $4 per acre, and so on have figures on profits from liming been secured from every state in the Union that shows a lime requirement. To enumerate them further would simply be to repeat.

But, on top of all this concrete evidence, and in spite of the support given to the liming campaign by agricultural colleges, extension forces, experiment stations, the farm press, county agents and other agencies, when we check up on our results it is found that farmers are using approximately only one ton of soil lime where they could profitably use 20 to 25.

What is the answer? I do not know, in fact that is one of the things that I hope to find out here at this meeting. Personally I do not believe that there is an answer, but whatever it is, there is one good thing to say—it all pertains to something that has already gone by. If the figures I have are correct and we are actually placing only one ton in a possible 20 or more, we at least have the satisfaction of knowing that one twentieth of the potential tonnage was made to yield. We cannot, of course, expect to start out this year and round up the other 19 tons, no matter what concerted effort, from whatever sources might be brought to play, but if figures do not lie, if the practical tests of doubting farmers mean anything, if the demonstrations of enthusiastic county agents may be justified, and if the conclusions of cold scientific investigators are based on sound premises then, while it is not at all feasible to expect an immediate 100 per cent yield from the entire potential tonnage, it sounds not only feasible but entirely possible for every manufacturer of a soil liming material to sell 2 tons of his product during 1925 for every one ton he sold in 1924 for even then the possibilities in this field would hardly seem to be uncovered. But actually, we know that this can hardly be accomplished, for it would be doubling our present business and that is surely a large order.

However, there is no myth about the potential tonnage being there and from the present outlook it would appear that good salesmanship can wring some of it loose.

Let us go back and review the situation a little. Last year, one of our large manufacturers said:

"The purchasing power of the farmer has been poor for a year or two past for reasons that are well recognized in farming communities. Our tonnages here have therefore been correspondingly light."

Another manufacturer said:

"The market for agricultural lime did not show a corresponding increase this year, due to general lack of prosperity to the farmer for a cosiderable portion of the year."

These two expressions of two large producers show quite clearly one rea-

son why agriculture did not yield more tonnage last year, but we are told that last year is gone now and this is another day. And such reasoning may well be justified, if we accept at par some statement made by the United States Department of Agriculture at Washington, from which I quote the following:

"As a result of the recent rise in grain prices, and the fall in prices of non-agricultural products, the combined exchange value of 16 leading farm products had an index rating of 83, taking the 1913 base as 100. This is the highest point reached in 47 months."

In other words, the farmer's products are on closest parity with factory goods in 4 years.

Another report from the same source says:

"Not in 5 years has the United States presented so nearly a picture of balanced prosperity as it does now. Go into the South and you will be impressed with its prosperity. Last year went a long way to wipe out the pressing burden of indebtedness. Another cotton crop bringing 1½ billions of dollars cash, plus a fairly good season with truck crops, potatoes, rice, and small fruits puts the South into a very comfortable position.

"The East, meaning essentially the dairy and diversified region, is in good shape as to feed crops, such as hay, silage corn, and oats and it is doing fully as well as last year with the leading money crops."

"Farmers in the corn belt are in better spirits than for 4 years, not so much from any great increase in income as from a feeling that the stage is being set for better times. The hog situation is coming out from under its burden of over production, and notwithstanding the poor crop of corn the Central states are obviously breathing easier than they have for a long time back."

"The Wheat Belt is in infinitely better shape than for 4 years. Yields are splendid, the crop of high quality and prices improved just at harvest time."

These quotations I have just read are from reports by the United States Department of Agriculture, and it is quite logical to figure that these people having nothing to sell the farmers but their services have no policy of making things appear rosier than they are, so that their statement that the farmer is in infinitely better shape than for four or five years need not be discounted to any great extent. The United States Department of Agriculture is also responsible for a statement to the effect that it is no secret that the maintenance of soil fertility problem on the majority of farms has suffered severely in the past few years by reason of the farmers decreased purchasing power and his consequent inability to buy clover seed, fertilizer and liming materials, without which any farm is seriously handicapped in the matter of keeping soils fertile.

However, while these reports of the farmers increasing purchasing power and his very evident need for soil liming undoubtedly indicate that the coming year offers possibilities in the sales of lime and limestone that have heretofore been somewhat hemmed in, yet nevertheless history is a great one to repeat itself and while we should certainly take steps to make a normal increase in our sales, it is equally certain that no one need plunge headlong into the production of agricultural lime or limestone on the strength of general appearances for in so doing he will certainly carry his enterprise into oblivion.

What we want to do is to work off the surplus already on hand. It is easy enough to locate limestone deposits in many parts of the country and to go ahead, if there is sufficient engineering ability and experience, and build a modern plant, but from data at hand, we can estimate very accurately that the present equipment of the combined lime and limestone industries will take care of any increased consumption that may come to pass in the next several years. Our big problem is not one of production but of marketing.

There is, however, reason to believe that if we proceed along lines of good salesmanship to acquaint the supply dealers with the situation as it actually exists today that a prosperous year may be enjoyed. By acquainting the dealers it is meant to impress it upon them in every sense of the word. A dealer is usually a substantial man in his community, knows his trade and wants to see his farmers prosper, for in the final analysis he knows that if they have money he in turn will prosper. He also affords the manufacturers ideal point of contact. If he can sell your product never worry but that he will keep a supply of it

in his warehouse, and it is therefore the dealer that should be persevered with.

The introduction of soil liming materials even today is more or less missionary work, as the term goes and many a lime and limestone salesman can find worse ways of spending his time in 1925 than to help the dealers canvass their trade. I am well acquainted with the reaction of many salesmen to the canvassing proposition and the old saying they have about "selling it once but not twice" and yet I know from experience that if a salesman can get into a dealers' good graces sufficiently so that the dealer or one of his men will go with the salesman among his trade that that salesman can often get his line in, and that they will get closer together and the dealer will pay more attention to the literature and advertising matter the salesman hands over.

Of course there is a tendency on the part of many salesmen to discount the value of the literature with which they are furnished but such salesmen are making a mistake. The best man in any business knows his subject and keeps abreast the chances that come to pass from time to time and the salesman who studies his subject as well as his prospect is actually far better equipped for the effort. I am saying a lot about the salesman, but if we are to get more tonnage it must be got by our salesmen, and if a sales man does not know his subject there is certainly not much chance of his passing something he doesn't have along to his dealer, and in such cases the prespective value of a whole castle of would be valuable advertising comes down in a single crash.

The outlook for soil liming in 1925 then would seem from almost every single angle to be bright but this is not the first time it has taken on a rosy hue that later on in the season paled away, we really should judge of the future only by the past, and in the past we know that the tonnage obtained was brought in only after hard fights by competent selling forces. It is therefore through competent selling forces and good business ethics that we must look to the healthy normal growth of the lime and limestone industries in 1925, and in so doing we may rest assured that we shall not only profit in our combined industries, but we will through the proper distribution of our product and its subsequent work in building up the fertility of the soil do much toward building up prosperous rural communities. Lack of lime goes hand in hand with low fertility, which in turn means poor livestock, poor buildings, poor homes, churches and schools. With the fertile area comes the prosperous community, fatter cattle, better roads, more attractive homes, more successful citizens and their consequent effect upon the welfare of our country.

The Concrete Aggregate Group also enjoyed an interesting session. Mr. Carl D. Franks, Assistant General Manager addressed this group at their Monday session on Concrete Aggregates. The many questions that followed this paper brought out many ideas. In fact this discussion really became an exchange of ideas. Mr. O. P. Chamberlain acted as chairman for this group and the attendance clearly indicated that his efforts were appreciated.

The Highway Group proved to have the most extensive program. It is safe to assume that the larger portion of the crushed stone producers are interested in highway problems. They seemed very well pleased with the program that Mr. H. M. Sharp, the chairman arranged. All of the three sessions had a large attendance. Speakers of authority addressed those attending. The discussions were active and to the point. The program was balanced to present every angle of the highway situation. A. T. Goldbeck presented an excellent paper on Crushed Stone Tests and Their Relation to the Service of the Finished Pavement. Mr. Goldbeck as Chief of the Division of Tests, United States Bureau of Roads was in a position to present facts that were enlightening. His remarks were concerned largely with the various tests that have been employed by his department to determine such qualities as hardness, toughness, cementing value, absorption, etc., of crushed stone. He also discussed in detail the new accelerated soundness test for rock.

Mr. G. E. Martin, Consulting Engineer for the Barrett Company addressed the same session on Crushed Stone and Tar Products for Road. His discussion was from the viewpoint of the public, the contractor, the public official and the producer. Mr. Martin then discussed the penetration and the water bound type macadam road as most nearly satisfying all four viewpoints.

The Sales Group under the direction of Mr. H. H. Brandon as chairman held a general discussion of sales problems affecting highways. The question of a national campaign in marketing crushed stone for road construction was discussed. The problem of balacing sales to production and production to sales was another subject of interest.

Monday evening the ladies attended a theater party while the men enjoyed a smoker and vaudeville entertainment. The annual banquet was held on Tuesday evening and the speakers and entertainment were well received. Mr. Otto M. Graves acted as toastmaster and those present can testify to his unusual ability in the manipulation of our language. Mr. Graves is indeed to be commended for the excellent program of speakers that were presented at the banquet. George Otis Smith, Director United States Geological Survey entertained and instructed his audience in an informal manner that went over. Mr. Smith regards the possibilities of the crushed stone industry as stupendous. The statistics presented gave some of the producers present great hopes.

Mr. C. J. Brister, Assistant Vice-President New York Central Railroad, also addressed the banquet from the railroad view point. Mr. Brister regards the crushed stone industry as a great potential shipper. In other industries, Mr. Brister notes a great waste and a diminishing tonnage for the railroads. His vision carried him to the point where he imagined the last man standing on the last rock leaving the next to the last rock into the last crusher supported by the last of something else.

Col. F. S. Greene, Director of Public Works, State of New York, delighted his listeners with his frankness and humor on the question of road building. Those in attendance at the banquet also listened to instructive and humorous talks by Mr. M. Y. Cooper and Mr. L. A. Boulay. Mr. Cooper has established an enviable reputation as a banker and home builder in Ohio. Mr. L. A. Boulay is confronted with a difficult problem as Director of Highways and Public Works for the State of Ohio.

A program of speakers with such wit and information are not often grouped together at one banquet. We often feel if one speaker is good the banquet has been a success. Then this banquet was the acme of success.

A. J. Schaffmeyer, City Engineer of Chicago, addressed the general session of the convention on Tuesday morning on "Modern Specifications of Crushed Stone for Street Improvements." Mr. C. N. Conner addressed the same session on behalf of Chas. M. Upham, State Highway Engineer, of North Carolina. Mr. Conner is State Construction Engineer of North Carolina. Another interesting feature of this same session was a paper on the Need and Usefulness of Local Associations by George E. Schaefer, Secretary, New York State Association. This paper and the discussions that followed of Mr. H. B. Allen, Secretary Eastern Stone Association and Mr. George Balfe, Indiana Association proved to be of great interest to those present. The value of the local organization was stressed.

The group meetings were held again on Tuesday afternoon starting with lunch. The concrete aggregate and the highway groups united for both the Tuesday and Wednesday sessions. Mr. Prevost Hubbard, Chemical Engineer, Asphalt Association, presented a paper on Crushed Stone products for Asphalt Roads and Pavements at this group meeting. He said in part:

"Because of the peculiar nature of asphalt and the fact that different grades are available for paving work it can be successfully used in a number of separate and distinct types of construction with such a variety of mineral aggregates as to make possible the utilization of local material to the maximum extent. Commercial crushed stone products are however more widely used than any other class of mineral matter and the great majority of asphalt pavements contain commercial crushed stone in amounts varying from 4 to 5 to 100 per cent of the total mineral aggregate.

"In the case of asphalt pavements, considered apart from any foundation upon which they may be laid, asphalt is ordinarily present only to the extent of from six to twelve per cent by weight, the remainder being mineral aggregate. It is evident, therefore, that as mineral aggregate is the predominating constituent, its character influence to a considerable extent is the characteristics of the pavement in which it is used.

"Size or grading of commercial crushed stone products is, however, a very important matter in connection

with the construction of asphalt pavements. In some cases the output should preferably consist of fragments of the same uniform size and in other cases the sizes should be graded from coarse to fine within reasonable limits. Above all things uniformity of output is a matter of importance as on a given job it is not possible to be constantly changing methods and properties to meet vari ations in sizes of crushed stone even if the different products could be successfully used by so doing.

"In all of our specifications for broken stone products, there is a general clause requiring that it shall be of reasonably uniform quality and clean. Incrustations of earth, clay or other foreign materials are particularly objectionable. because they prevent adhesion between the asphalt and the underlying surfaces. If the asphalt does not adhere to all contact surfaces, the pavement will be injuriously affected by water action with consequent disintegration. In addition to the above, for the larger sizes of commercial products, freedom from dust and an excess of flat or elongated pieces is specified. The presence of stone dust in unknown amount is objectionable, even if it does not adhere to the larger fragments as the total surface area of mineral aggregate is enormously increased thereby and the amount of asphalt required to coat and bind the aggregate together depends to a considerable extent upon surface area."

Mr. Norman Kelb, The France Stone Company presented a paper on crushed Stone versus Competing Materials. He discussed the field of promotion and direct sales in marketing crushed stone. A very interesting paper on Disposal of Stone Screenings was presented by Russell Rarey, Marble Cliff Quarries Company. This paper appears in a digested form elsewhere in this issue.

The Agricultural Lime and Limestone Group also met on Tuesday. Mr. J. A. Slipher of Ohio State University discussed the uses and requirements of lime. He stated that practically all agricultural crops respond to the use of lime. Mr. Russell East, Industrial Agent, Pennsylvania Railroad, discussed Railroad Co-operation with Producers in Marketing Limestone Screenings for Fertilization. Mr. East was county agricultural agent in Indiana for six years and like Mr. Slipher, has spent his life in studying liming materials.

The last session of the Concrete Aggregate Group and Highway Group combined proved to be very popular. This session held on Wednesday afternoon carried past the specified time because of the great interest. Col. Greene gave a most frank talk that was appreciated by those present. Mr. Greene discussed the penetration macadam pavement at length. Mr. R. M. Smith of the Highway Department of the Province of Ontario, Canada, explained in detail the work of his department and their attitude towards the road problem. Mr. H. S. Perry discussed the work of the maintenance division of the Ohio State Highway Department. Mr. A. R. Hirst in a talk full of punch discussed crushed stone as a superior road aggregate. He stressed the fact that a given strength of road is what should be bought. His remarks regarding the need of recognized tests in the crushed stone industry may result in some definite action.

The general sessions of the convention on Wednesday morning were well attended. Mr. Graves was in charge due to the absence of President Sloan who was called to Chicago Tuesday evening. Bruce Dodson, Manager, Casualty Reciprocal Exchange, Kansas City, Missouri, discussed Liability Insurance. Mr. J. V. Newbert, Engineer Maintenance of Way, New York Central Railroad gave an enlightening talk on ballast. Ballast represents about three per cent of the expenditure for railroad maintenance. Hardness size and cleanliness are the essential factors in ballast stressed by Mr. Newbert. Mr. Stimson, Chairman A.R.E.A. Ballast Committee discussed the tests and specifications of ballast. Toughness. Wear and Cementing Value were his three essential factors in the determination of a suitable stone. Mr. A. R. Hirst also addressed this session and his remarks were confined to the highway departments and their programs.

The last general session was held Thursday morning. Mr. Fred N. Withey, Vice-President, National Surety Company, New York gave an address on "Surety Bonds."

The various committees made their reports and the following officers were elected: President, Mr. Otto Graves; Vice-Presidents, Thomas McGrosky, Normal L. Helz, A. J. Blair, C. M. Doolittle and Stirling Thompkins, Treasurer, James Savage; Secretary, A. P. Sandles; Assistant Secretary, Claude Clark.

American Road Builders' Association Holds Record Convention

Attendance Shows Keenest Interest in Highway Construction Over 280 Exhibitors Display Machinery to Great Gathering

THE twenty-second annual convention of the American Road Builders' Association is now a thing of the past. Every session this year was well attended, and although no attendance records were kept, there is no doubt that more people were present at the sessions than at any previous convention. The program committee, headed by Professor T. R. Agg, deserves great credit for its work. The speakers were all interesting from start to finish and those who attended gave evidence of their appreciation.

The convention sessions were held January 6th, 7th and 8th in the Gold Room of the Congress Hotel, while the exhibitors displayed their machinery at the Coliseum. The exhibition at the Coliseum lasted from January 5th through the 9th. The entertainment features consisted of an Exhibitors' stag party at the First Regiment Armory, January 6th; the Road Builders' annual stag banquet in the Gold Room of the Congress Hotel, January 7th; the theater party for the ladies January 7th, and the informal supper-dance and cabaret at the Club Chez Pierre January 8th.

Several thousand road builders attended the exhibition stag party, where athletic contests and vaudeville entertainment constituted the long program. The attendance at the annual stag party taxed the capacity of the Coliseum. At the Auditorium Hotel the rooms adjacent to the Gold Room had to be opened, and they were filled to capacity. This banquet can best be described as a riot of fun and a lot of good sense. During the feast a delightful program of singers entertained those present. After the feast short talks were given by John J. Sloan, President of the Board of Local Improvements of Chicago; Edwin P. Morrow, Ex-Governor of Kentucky, and William H. Connell, Engineering Executive and Deputy Secretary of Highways, State of Pennsylvania, and the newly elected President of the American Road Builders' Association. Mr. James H. MacDonald served as President of the feast, and Mr. Wilbur D. Nesbit proved to be an entertaining toastmaster. The informal supper-dance was the scene of a fitting climax to the entertainment features of the convention. This party started at 9:30 P. M. and continued all night. Some of those in attendance enjoyed themselves so much that they hadn't recovered when this issue of PIT AND QUARRY went to press.

President J. H. Cranford opened the twenty-second annual convention on Tuesday morning, January 6th, and spoke briefly on the work that the Association has done in the past and what it hopes to accomplish in the future. He then introduced Thomas H. MacDonald, chief of the Bureau of Public Roads.

Mr. MacDonald talked on the development of national roads through federal aid and brought out a number of interesting facts. During the course of his speech Mr. MacDonald said:

"If the federal aid road projects completed during the twelve months preceding July last were placed end to end along his route—and land and sea were equally satisfactory foundations for the roadbed—the traveler would have a new roadway of the various standard types for the whole distance, 8,620 miles.

"The first job of the highway builder is to make possible the flow of traffic generally throughout the United States. It would not be fair to perfect in detail a system in one section of a state or of the United States and leave untouched for years to come the highways in other sections. The actual operations of construction must be widespread. Such a policy is fair and is the only possible course to pursue. No highway administration can survive that does not rapidly provide reasonable service throughout the extent of its jurisdiction. On this principle the highways of this country are being developed, but it is a dangerously expensive plan unless each process is a part of a sound, pre-conceived plan, and each new project and each additional expenditure of funds a necessary step in the fulfillment of this pre-conceived plan.

That such a definite plan of major highways has been established, looking into the future more than ten years for its initial completion and perhaps a quarter of a century for its perfection in detail, I regard as the most perfect accomplishment of the federal road legislation.

"A very wrong impression is current that federal aid is of usefulness only in the more thinly populated sections of the country. Congestion of traffic in the more densely populated areas of the eastern section of the United States is demanding highway facilities that require an immense expenditure of funds, and dollar for dollar the federal road appropriations are probably serving more traffic east of the Mississippi than west. A situation exists in the western part of the United States, however, that can only be remedied by the application of federal funds, or at least only will be r emedied within any reasonable time from this source. In the nine states of Oregon, Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico the primary roads alone of the federal highway system will aggregate 10,750 miles. Of this mileage 3,290 are unimproved and 2,290 are graded or lightly surfaced; that is, more than one-half of the primary mileage, which includes all the main transcontinental routes, are unimproved or are improved by grading only with a small mileage of light surfacing with selected materials. Of these latter two classes, there are about 1,970 miles graded and 320 lightly surfaced. The only possibility of going forward with the improvement of these roads on an adequate yearly scale lies in federal funds, and it is only just that such appropriations be used, since so large a part of the total area is made up of public lands.

"In view of the controversy which waged a few years ago over the federal highway legislation, it may be noted that there is gradually being worked out a plan which is, in effect, a combination of the two ideas of federal aid roads and of national roads. The combination is more applicable to the national problem as a whole than either policy alone. This is particularly true, since as the roads are completed their utilization by the traffic has resulted in constantly increasing funds from the road user to maintain them. There is every reason to believe that wherever the federal highway system is improved the necessary maintenance funds can be secured from automobile licenses and the gas tax to maintain these roads adequately."

Mr. A. B. Fletcher, Consulting Engineer, Bureau of Public Roads, addressed the Tuesday afternoon session. Mr. Fletcher described an inspection of British rural roads in the spring of 1924, saying that there are many similarities between the English and American roads. They are more crooked than even roads in our older states. They have been mostly improved by putting down hard surfaces within the limits of the existing rights of way. Great Britain still has from 20 to 25 per cent of its highway loads moved by horses as against perhaps 10 per cent of that sort in the United States. Mr. Fletcher states, however, that he nowhere saw roads so rough as are most of our rural roads, while on the other hand he saw hardly any so smooth as the best roads in the United States built by state highway departments. In our case we have developed high grade roads faster because of the greater urge and demand in this country. In all England, Wales and Scotland there are but 177,000 miles of road, cities and boroughs included, as against our approximate mileage of 2,941,000 outside of cities and towns.

Mr. H. R. Trumbower, Economist, Bureau of Public Roads, also spoke on the financial problems of the state highway departments. An abstract of this paper appears elsewhere in this issue. Mr. S. K. Markman, attorney, of Chicago, spoke on the subject, "Legal Aspects of Trunk Line Roads Through Cities and Villages." His address dealt with the subject of the conflict between state and county highway officials and municipal authorities in the construction of trunk line roads partly lying in cities and villages. The failure of state legislatures to authorize state and county highway officials to co-operate with municipal authorities in the construction of such roads to secure proper strength, width, grade, and drainage without resorting to the many subterfuges at present employed is a problem confronting state and county highway officials, which must be solved if the best and most useful purpose of such roads is to be achieved.

Mr. W. D. Warren, Consulting Engineer, Decatur, Illinois, spoke on the

subject, "Brick Pavements." Mr. Warren emphasized certain features in the recognized principles of pavement design as applied to brick pavements as follows: (1) Recent research data; (2) Differences in design of highway and street pavements; (3) Economy of sub-grade treat; (4) Relation of sub-grade and foundation; (5) Thin brick wearing surface; (6) Resurfacing with thin brick.

Mr. W. H. Connell, Engineering Executive and Deputy Secretary of Highways of the State of Pennsylvania, was the first speaker on the program on Wednesday morning. Mr. Connell's address was on the subject, "The Relation of Traffic Surveys to Highway Programs." Mr. Connell discussed at length the kinds of construction needed in specific classes of territories and in particular he described the work which Pennsylvania has been doing during the last few years in studying traffic conditions. The purpose of such study is to determine the future traffic needs of a state highway transportation system. It necessitates a knowledge of the different kinds of traffic using the highways, and an economic and industrial study of the state, taking into consideration the areas of the various industries such as coal, oil, agriculture, dairying, etc. The most important phase of the problem of highway business today is planning highway systems that will adequately provide for the future traffic needs.

Another speaker on Wednesday's program was Mr. Arthur H. Blanchard, Professor of Highway Engineering and Highway Transport in the University of Michigan, who spoke on the subject, "The Evolution of Highway Traffic." Professor Blanchard's discussion, based on a wide study of highway conditions, was a survey of the past and a forecast of the possibilities of the future.

Mr. E. N. Hines, Chairman of the Board of Highway Commissioners of Wayne County, Michigan, talked on the subject, "The Super-Highway Plans of Wayne County, Michigan." Wayne County, in which Detroit is situated, has been a leader in the development of the concrete road and is proceeding with extensive plans for highway building.

The first speaker of the afternoon session was Mr. E. S. Taylor, Manager, Chicago Plan Commission. Mr. Taylor described the plans for road and street improvement in the famous plan of Chicago. Eleven of these projects have to do with improvement of thoroughfares, and the address covered the various improvements already made under this commission.

Mr. F. T. Sheets, Chief Highway Engineer, Division of Highways of the State of Illinois, followed with the subject, "Problems of State-Wide Highway Maintenance." Maintenance as a primary function of a well organized state highway department was discussed by Mr. Sheets, who divided the subject into the following heads:

1. The maintenance of paved roads on the state's primary system.
2. The maintenance of detours around construction in progress on the state primary system.
3. The maintenance of the unpaved portions of the state system. This latter function is intended to give the greatest degree of highway service possible prior to construction of a high type wearing surface.

There are also secondary, but very important maintenance functions which confront a state highway department:

1. The installation and maintenance of complete highway marking, traffic warning, and operating signs.
2. The thorough policing should embrace control of truck loadings and speed of passenger vehicles.

Mr. Sheets discussed the building of a proper maintenance organization and cited the efforts made in this direction in various states.

The last speaker on Wednesday's program was Mr. A. H. Hinkle, Maintenance Engineer, Indiana Highway Department, whose subject was, "Utilizing the Salvage Value of Old Roadway Surfaces." Mr. Hinkle has had a large part in the remarkable work of the Indiana Department in the reconstruction of some of the older roads of that state and cited many examples of salvage and methods of handling such problems.

At the close of the afternoon session on Wednesday the results of the annual election of officers were announced. The officers for the coming year are as follows: W. H. Connell, Engineer Executive and Deputy Secretary, State Highway Department, Harrisburg, Pennsylvania, President; W. R. Smith, President, Lane Construction Corporation, Meriden, Connecticut, Vice-President; Northeastern district, W. S. Keller, State Highway Engineer, Montgomery, Alabama,

Vice-President, Southern district; S. F. Beatty, Vice-President, Austin-Western Road Machinery Company, Chicago, Illinois, Vice-President, Central district; Hon. Samuel Hill, Life President, Washington State Good Roads Association, Seattle, Washington, Vice-President, Western district; James H. MacDonald, Construction Road and Paving Expert, New Haven, Connecticut, Treasurer.

The first speaker on Thursday morning was Mr. P. Hubbard, Chemical Engineer, The Asphalt Association, New York, who spoke on the subject, "Determination of Stability of Asphalt Paving Mixtures." Mr. Hubbard spoke of the investigations made into the methods of determining stability relations of various paving mixtures, which it is believed will soon clearly develop certain fundamentals of the subject which are at present unknown or only a matter of theory. Special reference was made to the work of E. S. Pesson and the United States Bureau of Public Roads, and to a report on laboratory investigations of a new theory of sheet asphalt paving mixtures by M. F. MacNaughton. The speaker gave a description of the apparatus method of testing used. This apparatus consists of a cylindrical mold with an internal diameter of two inches, equipped with a snug fitting plunger.

Mr. Frank Page, Chairman of North Carolina Highway Commission was to have given an address on the subject, "The Contribution of Research to Highway Progress." As Mr. Page was unable to be present, Mr. Chas. M. Upham, State Highway Engineer, Raleigh, North Carolina, spoke extemporaneously on the subject. Mr. Upham stated that thousands of dollars are wasted annually in building roads because of the error of going ahead without sufficient knowledge of scientific road building. If instead, state and county highway builders would find out, at length, the results of research work in this line, this waste could be avoided. In one state $1,000,000 was wasted in one year because of this lack of knowledge. Much duplication of effort and research work as between states and counties could be avoided with a clearing house of research work from which the results of authoritative research could be distributed to the various state and county highway commissioners. Research work is of no value until it is applied practically. Mr. Upham cited examples which were very interesting.

The subject, "Dust Elimination on Gravel Roads," was discussed by Mr. B. C. Tiney, Maintenance Engineer, Michigan Highway Department. This is a subject of vital interest to all who have driven over gravel roads in summer. Mr. Tiney explained what is being done in Michigan to solve this problem of dust.

The morning session closed with the discussion of "The Final Link in the Lincoln Highway in New Jersey," by Mr. H. D. Robbins, Division Engineer, New Jersey Highway Department. In his speech Mr. Robbins described the building of the final link of the Lincoln Highway 57 6/10 miles in length, beginning at the Hudson River and ending in Trenton. This was constructed of two-line reinforced concrete ten inches in thickness and of 1:1¾:3½ mix, comprising the new surface of 19,230 square yards on grades up to 5 5/10 per cent. Sheet asphalt with 1½ inch binder and a 1½ inch top on an ⅛ inch plain concrete base, 1:3:5 mix, laid over 50,371 square yards on grades up to 3.78 per cent. Granite block with asphalt filler on 6 inch concrete base was laid on 4,482 square yards between trolley tracks. The width of the concrete surface was 30 feet, the sheet asphalt from 20 to 30 feet, and the granite block 9 feet. The total cost of the entire job was $515,000, exclusive of bridges plus a charge of 3¼ per cent for field engineering and inspection. Considerable improvement was made on the original alignments, widening and eliminating dangerous curves, and the replacing of old bridges with new ones to meet the demands of traffic.

The first speaker on Thursday afternoon program was C. N. Conner, State Construction Engineer, Raleigh, North Carolina, whose subject was "Form Setting and Its Relation to Riding Qualities of Concrete Pavements." The problem that was presented by Mr. Conner was the building of straight, true and smooth highways, solvable only in one way, by the use of reliable steel side forms that will stay true in place throughout construction. Mr. Conner cited the investigation of the United States Bureau of Roads, which showed conclusively that it is not the dead weight of motor trucks that destroys the highways. If a full truck strikes an obstruction in the road or if the surface is uneven,

the wheel comes down on the road with a thud at every wave or break in the surface. It is this impact that does the destroying, crushing the surface and finally breaking the foundation. The use of reliable road building forms is essential to the building of smooth roads. Mr. Conner outlined the history of road building methods and the types of forms used and stated that the latter have not been given the consideration that this class of equipment should receive. His address went very specifically into the details of the kinds of forms used and the effects upon the quality of road surface produced.

H. F. Clemmer, Engineer of Tests, Division of Highways, Springfield, Illinois, was the next speaker whose subject was, "Investigations of Smoothness of Pavements." Mr. Clemmer described the method used in Illinois for detecting irregularities in pavement surfaces. The last paper of the convention was that of O. L. Kipp, Construction Engineer, Minnesota Highway Department, on the subject, "The Evolution of Construction and Maintenance Equipment."

Among the resolutions with which the afternoon session closed was the following: Resolved that the Permanent International Association of Road Congresses deserves the support of the members of this Association and that the United States should become officially a member of the International Association.

The adjournment of the twenty-second annual convention of the American Road Builders' Association brought to a close one of the greatest and most interesting conventions ever held by this association. The success of the 1925 Convention and Road Show may be attributed largely to the splendid support and hearty cooperation given by the Highway Industries Exhibitors Association, Chairman and members of different committees concerned with the convention, the city of Chicago, the Chicago Association of Commerce, the Coliseum company, the Chicago Hotel Men's Association, and to all organizations who aided the enterprise.

Sandusky Cement Company, Cleveland, announces the appointment of A. T. McCormack as general sales manager succeeding Clinton B. Rogers, recently resigned.

Corporation Changes Name

ON December 3, 1924, the corporate name of the Pawling & Harnischfeger Company of Milwaukee, Wisconsin, was changed to Harnischfeger Corporation. This change of name is merely the public acknowledgement of the debt which the organization owes to its president, Mr. Henry Harnischfeger, through whose energy, foresight and genius,

Henry Harnischfeger

the present standing and size of the company have been made possible.

Mr. Harnischfeger entered into a partnership with Mr. Alonzo Pawling forty years ago, and these two men, with ambition, determination, and experience in their respective trades as their principal assets, started a business in a small 26x50-ft. one-story building in the city of Milwaukee. Their shop equipment at that time consisted of an engine lathe, drill press, pattern maker's lathe, wood planer and a few other tools, all driven by a little 4x6 slide valve steam engine, insufficient in power to drive both lathe and planer at one and the same time.

Among the different kinds of ma-

chines built in the early days may be mentioned file-cutting machines, grain conveyors, carving machines, brick making machines, bolt clippers, knitting machinery, the Nordberg poppet valve governor, and various other products. An interesting fact in this connection is that two other large and prominent institutions grew up from the products originally built in the small shop of Pawling & Harnischfeger. These are the Chain Belt Co. and the Nordberg Mfg. Co., the latter having developed from the poppet valve governor designed by Mr. Bruno Nordberg.

Pawling & Harnischfeger soon outgrew their small and cramped shop quarters and added another floor and a few years later added a three-story extension. In 1887 an event occurred at a local manufacturing plant which was destined to play an important part in the future of Pawling & Harnischfeger. The Edward P. Allis Co. (now the Allis-Chalmers Mfg. Co.) placed Mr. A. J. Shaw in charge of the rebuilding of one of the rope driven traveling cranes then in operation at their plant. Mr. Shaw devoted considerable time and thought to the task and his solution, though simple, revolutionized traveling crane design. Instead of using a complicated makeshift rope drive mechanism, Mr. Shaw conceived the idea of providing a separate electric motor for each motion, namely, hoisting, bridge travel, and trolley travel. This was the first three-motor electric traveling crane ever built.

The operation of the first crane was so successful that a company was organized to manufacture cranes with individual motor drive for each motion. In this new company were associated Mr. Pawling, Mr. Harnischfeger and Mr. A. J. Shaw under the name of the Shaw Electric Crane Co., with Mr. Henry Harnischfeger as president. From this time on, Pawling and Harnischfeger became permanently associated with the crane industry.

Later Mr. Shaw withdrew from the company, and in addition to the building of a complete line of cranes and hoisting machinery, Pawling & Harnischfeger extended their line to include steam feed engines for saw mills, steam steering gears for ships, and special machinery for the brewing industry.

In manufacturing parts for the various P. & H. Products, a need developed for boring and drilling machines which could do accurate work with a minimum amount of set-up time. To meet this need, a number of horizontal boring and drilling machines were built. These proved so sucessful that a large number of machinery manufacturers desired them for their own shops. As a result, a special department of Pawling & Harnischfeger was devoted to the manufacture of a complete line of horizontal boring and drilling machinery. Centering machines and radial wall drills were later added to this line of tools.

On January 7, 1910, the partnership was incorporated under the name of "Pawling & Harnischfeger Co." In July, 1911, Mr. H. Harnischfeger purchased Mr. Pawling's interest in the business, Mr. Pawling then retiring to care for his private enterprises until his death, in May, 1914.

In 1913, the company began building a line of gasoline driven excavators. Prior to this time, excavating machinery was built much on the order of agricultural machinery with shafting, etc. Mr. Harnischfeger, however, believed that excavators should be built the same as any other high class, heavy duty machinery, using machined castings, forged and turned shafting, cut gearing, etc., and that the contractor, like any other good business man, would pay for high grade design and construction, if in the end it meant greater life to the machine and profit to its user. Time has proven that Mr. Harnischfeger was right and P. & H. excavators are now being produced at the rate of 25 to 30 per month.

The ever increasing demand for P. & H. products has continuously necessitated extensions and improvements to the plant and its facilities. In 1923 a new extension of 35,500 sq. ft. was added to the main shops. Power house facilities were increased by the addition of another 1,000 H. P. generating unit. The Hercules Steel Casting Plant was purchased in 1924 and forms the last link needed by P. & H. to establish a complete control over the manufacture of their products from raw materials to finished machine.

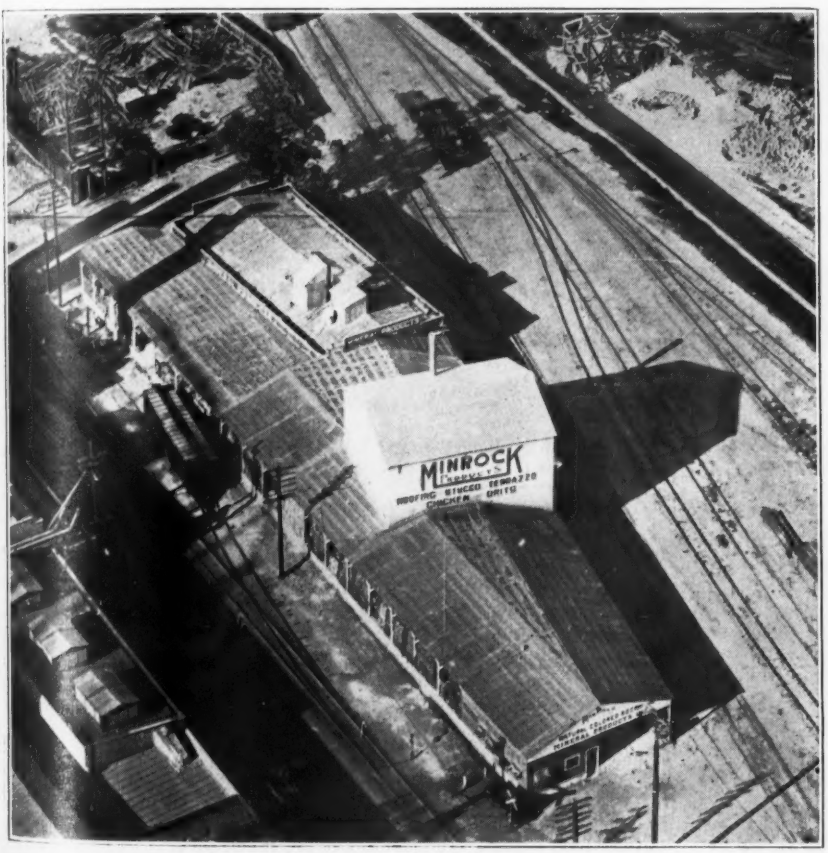
The recent change of name to Harnischfeger Corporation is accompanied by no change in management, administration or business policies. The same "Quality"—"Service" trademark will be carried by all products of the organization.

The Mineral Products Incorporated Crushes Non-Metallic Ores

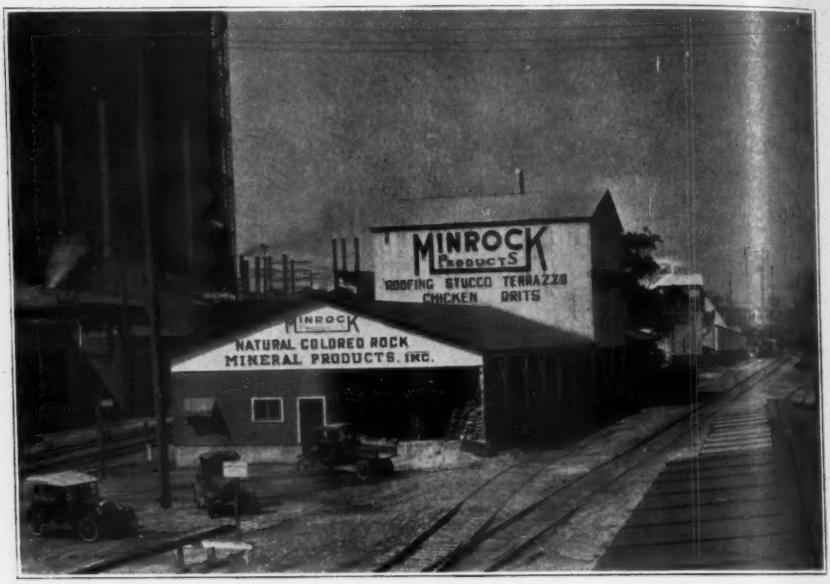
Electrically Operated Plant with Small Labor Cost Company Operates Three Complete Units for Grinding

THE plant of the Mineral Products Incorporated of Los Angeles, California, consists of three, complete in themselves, units of machinery for grinding of non-metallic ores. There is approximately 20,000 square feet of warehouse space with concrete floors. The plant is served by two railroad sidings. One is for loading, being about 100 feet long and the other for crude material being about 300 feet long and accommodating six cars.

The main unit of machinery is used exclusively for coarse grinding of hard materials, turning out various grades of roofing rock, roofing granules, stucco dash, poultry grits and material for terrazzo flooring. The crude material is unloaded from gondola cars into a 12x24 Acme all steel crusher with 1½ inch opening. The material is then elevated to a height of 50 feet, in 7x12 buckets, housed in a 4x1 feet 6 inches steel casing, and falls into a 3x8 Trommel screen with wire having ½ inch openings. The oversize from this screen is next fed



An Airplane View of Property.



General View of Property.

Interior View Showing Storage Facilities.

into a number 3½ all steel Wheeling crusher, set to ½ inch and is returned to the number 1 elevator and is once more fed into the Trommel screen. Material passing through the ½ inch Trommel screen then falls upon a 3x8 three stage overstrom vibrating screen. The top screen wire is 4 mesh, the second 10, the third 30 mesh.

Material passing through the 4 mesh screen and retained on the 10 is called the number 1 roofing product which is piped to a bin. The product from the 10 to 30 is the number 2 roofing product, used by the paper companies for the mineral surfaced paper and shingles. The product from the 30 minus is mostly waste. The oversize from the vibrating screen falls into a set of 36x16 Colorado iron rolls and thence into the number 2 elevator, same size as the first, and is elevated to a height of 50 feet to a two stage Cottrell vibrating screen. The first being a 10 mesh screen and the second a 30, giving more number 2 roofing product.

The oversize from this screen then falls into a set of 30x14 Denver Engineering rolls and is crushed to approximately ⅛ inch and is returned to the number 2 elevator which feeds the Cottrell vibrating screen, giving the number 2 roofing product only.

Eye beams and carriers are suspended over the two sets of rolls to facilitate the removal of worn shells to be turned. The dust is removed by air suction generated by a 42 inch Buffalo fan from the chutes, elevators and bins and separated by a cyclone and tubular. The tubular gives a very fine airfloat product, suitable for the paint trade.

The second unit is one very similar to the one just described, only on a smaller scale. The third unit consists of a 2½ Wheeling crusher, two Marx mills, cyclone and tubular for fine grinding. The capacity from all three plants, running eight hour shifts is approximately 1,500 tons of salable products per month.

The labor requirements are small. The large unit is operated by four men, two feeding the crusher and two sacking. The small unit requires about three men. Another man at times is necessary for loading cars, trucks, etc. The monthly payroll averages approximately $1,100.00. The plant is run entirely by 440 volts 50 cycle electric power, driving eight motors, totaling 260 H. P. Mr. A. B. Brady is secretary and treasurer of the Mineral Products Incorporated.

View of the Sacking Room.

Disposal of Stone Screenings*

IN ALMOST every stone crushing plant the maintaining of a proper balance between the production of and demand for each of the various stone sizes constitutes a difficult problem. As a general rule, a stone producer has one major market for his material and his plant is designed to produce the proper size for that particular market. Other sizes currently produced under such conditions are marketed as opportunity presents or are regarded as waste and taken to the dump. Usually plants are installed to produce stone of comparatively large size, such as flux, railroad ballast, macadam stone, coarse concrete aggregate, etc.—the excess production, therefore, usually being classed as screenings.

In Ohio where we build macadam roads of merit and at favorable costs, we are marketing much stone on macadam construction. A plant engaged in the production of macadam stone, has its demand fairly well balanced, with the screenings being in current demand. The producer of stone for other markets, however, has excess fines, and it is a real problem to move excess screenings currently.

One of the best ways to turn excess fines into profit is to reduce the quantity of the excess. This statement is so simple that it perhaps needs explaining. Let us cite a specific case to make our point. In Pennsylvania, crushed stone is specified for use as coarse aggregate in concrete road construction the required size being 2½ inch down to ⅜ inch. The sand used along with this stone is of maximum ¼ inch size. A spread in size therefore occurs between the minimum stone and maximum sand sizes. It is generally thought that all other things equal, best concrete is secured when there is no spread between the fine and coarse aggregates. In Ohio stone specifications for concrete run down to 4 mesh—sand being from 4 mesh down. Ohio specifications as to minimum size of the coarse aggregate if adopted in Pennsylvania, would greatly reduce the amount of excess fines now troubling many Pennsylvania producers, and untold benefit thereby would be secured.

At our own plant at Marble Cliff, Ohio, we produce large quantities of flux, railroad ballast, etc., having had in times past much excess screenings. After considerable investigation we installed a washing and sizing plant designed much along the lines of a gravel outfit. This plant is fed with stone 2½ and less from the initial crushing. The stone in passing through the plant is thoroughly scrubbed, properly sized and placed in bins. Sizes produced are made to conform to Ohio State Highway specifications and fair demand for each of the various sizes is experienced. Number 6 stone is the smallest size of commercial stone used under any Ohio specification. This stone runs from ½ inch opening down to about $\frac{7}{32}$ inch round. Stone of size smaller than $\frac{7}{32}$ inch is screened out and is carried along with the washer water to sand settling devices where it is dewatered and the small stone trapped into bins. This fine material is called limestone sand and fully answers the requirements of a high grade, fine aggregate.

Sand specifications in Ohio state that "concrete sand shall be composed of small particles of hard durable stone of ¼ inch size and less graded from coarse to fine, with not to exceed 5 per cent passing a 100 mesh screen. Sand shall be free from foreign organic matter, etc." Under such specifications it is very evident why stone screenings will not be acceptable and likewise evident why limestone sand is entirely acceptable.

In the matter of soundness of particles and freedom from organic matter, freshly crushed stone leaves little to be desired, while the grading and removal of excess silt and flour is accomplished by the washing plant.

We are able to produce reports from various engineers who have tested our sand both in laboratories and in actual construction work, such reports being highly pleasing. We can also show specimens of completed structures where our aggregates both stone and sand were used exclusively in the concrete work, such structures being mute evidence of the excellence of the materials.

*Digested from a paper read by Mr. Russell Rarey, Marble Cliff Quarrier Company, before National Crushed Stone Convention, January 13, 1925.

The Palm Beach Sand & Supply Co., West Palm Beach, Fla., has been incorporated for $100,000.

Important Sand and Gravel Problems Discussed at Convention

Sand and Gravel Producers Exchange Ideas and Aid Industry Those in Attendance Find in Convention Values of Cooperation

THE ninth annual convention of the National Sand and Gravel association held in Chicago, January 5th, 6th and 7th marks another definite stride in the progress which the Association has made in its nine years of existence. The Association celebrates its birth in the town where it was started in holding the convention in Chicago. The convention consisted essentially of three technical sessions and an informal dinner.

The first session of the convention was called to order at ten o'clock on Tuesday morning by President John Prince of the Stewart Sand Company of Kansas City. After a few remarks of welcome Mr. Prince introduced Mr. J. J. Sloan, President of the Board of Local Improvements of Chicago. Mr. Sloan welcomed the members and guests of the Association on behalf of Mayor Dever. During his address of welcome Mr. Sloan remarked,

"Personally I think you were very wise in coming to Chicago. Chicago is not only the greatest grain market in the world, the location of the largest meat producing establishments in the world, the greatest furniture manufacturing center in the world, the greatest electrical supply center in the world, and a score of others from mail order houses down, but I think with its enormous consumption in the building and paving program in the city of Chicago last year that consumed relatively five and a half million ton of your sand and gravel, it is fast becoming the center of the consumption of the product you produce. There is no reason in my mind why that record should not be continuous as long as the aggregates that meet the necessities of the occasion are properly prepared and are carried in sufficient stocks for prompt delivery.

I think the further fact that you are fortunate in coming to Chicago is the fact that of all the centers in the United States, as I see it, there is no center that is such a glaciated district as that in which Chicago is located. All through Wisconsin and Northern Illinois, and in other sections, we have the terminal moraines that reflect what has been left of the glaciation of other days. Our old bed of Lake Michigan that adjoins us on the East, undoubtedly, at one time statistic determinations can prove must have had a glacier of ice a couple of miles high that brought down a wealth of glaciated material that men today in your respective pits, if you are in that section, reap the benefits of, pushing up, as it did, an elevation of land about 106 feet high above the level of the lake at Chicago, known as our summit, that forms a watershed between Lake Michigan and the Des Plaines River Valley.

Geologists tell us the glaciers known as the Green Bay glacier particularly, the Chicago glacier in the later day, came down mainly with a northerly and southwesterly strike, turned inland, and deposited these terminal moraines, not only in Northern Illinois, evidently the glaciers had the judgment to perceive that some day there would be a great city nearby and they were preparing a wealth of material to help build it.

I don't suppose the glacial deposits of Wisconsin and Northern Illinois are equalled anywhere else in the country. The residual deposits that we find in the other stream beds carried down by the water courses of bygone days, the deposition of mountain ranges and other places that have been washed down in the deterioration during the ages, in their entirety do not begin to equal that which the glaciers brought down from Northern Canada with its wealth of mineral content of all kinds that has made Chicago the center of a district at least a thousand miles square, ranging, as it does, from the Canadian line on the north to the Ohio River on the south, and from the Alleghanies on the east to the old Sioux mountains on the west, with a soil all prepared and capable in its area of supplying all the substantial needs of humanity's necessities to feed a world. If you add to it the center that Chicago holds just in feeding the human population, it has certainly earned the title of the bread basket of the world.

If we add to that natural advantage of Chicago the enormous deposits of iron ore within five hundred miles to the northwest and nearby, the enormous deposits of copper, and a little farther down the deposits of zinc and lead that extend down to the Oklahoma border, and in our own state the great deposits of coal that forms the very engine of power in industry today, couple it all with the wealth of the woods that cover the entire area, place it in a climate with an arranged temperature and rainfall, located as it is in the path of storms that ever circle the North Pole, giving us our thirty-five to forty inches of rain a year, absolutely insuring us against draught, do you wonder that Chicago is spreading and the demands for paving and building and the other activities that your products enter are constantly on the increase?

Today we have a program ahead of us of relatively $600,000,000 in building alone, of 180 odd miles of street paving and 100 miles of alleys on top of that, just public work alone, within the confines of the corporation of the city, so you can readily see the possibilities for extension and development, all being required due to an extensive growth of population of about 100,000 a year being added to the city of Chicago, coupled with those natural advantages the fact that it is the center of the greatest distributing area of the country, with twenty-nine railroads, of something over 250,000 miles of railroads centering right here in Chicago, or more than fifty per cent of the entire railroad mileage of the United States, a population of 40,000,000 people an overnight's ride from Chicago, all affording vast distributive facilities for your products as well as the countless other industries that are constantly being added to our city.

Mr. Frank W. Renwick was next introduced to the convention. Mr. Renwick who is head of the Chicago Gravel Company was the first president and one of the organizers in 1911 of an association known as the National Producers of Sand and Gravel. This organization in 1911 was the first attempt to organize the sand and gravel producers on a national basis. This association was revived in 1917 and has grown to be the great active association that the National Sand and Gravel Association is today. Many of the early organizers and members were present at this ninth annual convention.

Mr. Prince in his address discussed the growth and progress of the Association. Some of Mr. Prince's remarks follow.

"Considering the condition surrounding the organization and that tremendous dislocation of all industries due to the war, and considering the threat against the continuance of business, particularly of those members who were removed from the Seaboard, it is but natural that the activities of the Association should have centered in and been largely confined to the problems connected with railroad transportation. It was first the question of car supply and that question continued for some years, in fact it has been only during the past year that car supply has ceased to be of outstanding importance to producers depending on railroad transportation.

When the movement to increase rates started, it found the railroads suffering under years of regulation without assistance, suffering under rates built up through years of highly competitive operation, and found them in no position to meet the capital expenditures necessary, and the expansion in operation required by the emergency of war. The increase in rates put into effect, startling to producers who depended on railroad transportation, reached a point where many of us believed the continuance of such rates would entirely put us out of business. It was but natural that the activities of the Association should turn to the fight on railroad rates. It was not until the present time that some of us could see the increased rates, disastrous as they were to a few, and a hardship to all, were but the necessary outgrowth of the economic situation. It was difficult for us to realize at that time that rates were not in fact a national issue, but were of necessity a local issue to be handled successfully only by the individual producer negotiating with the railroads serving him.

To carry on a national effort to reduce rates and to prevent further increased required financial ability beyond the resources of the Association as it then existed with the result that the Association went into debt. For the past three or four years we have struggled with this debt until today, when Mr. Shiely will report to you that through the able and economical management of our secretary, Mr. Barrows, we are now entirely out of debt and have a cash surplus.

We have, as an Association, passed

through the crisis of the war and have, I believe, passed through the painful but necessary period of reconstruction. As an Association we have paid for our part in the war and during the past year have been faced with other groups of problems which have begun to point out to us the way for our future progress and the direction of growth which the Association will now follow.

During the period I have just described, difficulties were faced and no doubt mistakes were made. A large group of producers along the Seaboard who were not concerned with freight rates, felt that the National Association was merely an organization to fight the railroads. Naturally, they saw no reason to join us.

But all of these efforts were not wasted. The direct results may have been of no consequence but indirectly they brought the industry as a national organization prominently before many branches of government in Washington, before the railroad organization and before the public to an extent that makes much easier the accomplishment of our present and future obligation. We are recognized by all as an industry of fundamental importance and as an aggressive National Association.

Now we are faced with the problems of developing the industry and of securing more intelligent use of our material. We must justify the tremendous investments that have been built up in the industry to provide aggregate of high class and uniform quality to meet the specifications which have developed during the past few years.

There are two groups of activities the needs of members have developed and which the Association should contain. The one is the personal service rendered by the organization in the Washington office and to which a startling array of successful accomplishments can be credited. These have to do with the many individual problems of producers and bring our organization into contact with practically every department in Washington. Only those companies who have made use of this opportunity realize the advantage of the service rendered. A large percentage of our members who do appreciate this service and have made use of it know fully the thorough way in which Barrows, Ahearn and the other members of the organization carry out the commissions given them. The value of this service is very great and the Washington office has many testimonials from members setting forth this value.

The second group of activities concerns the industry as a whole and includes those which only an organization of this kind can carry out. These are sometimes called promotional activities, although the name is not a good one. Most of the important industries have such organizations and many of them have been of tremendous influence for the good of their industry. The Portland Cement Association with which you are all familiar seems to me to offer a splendid illustration of the course our Association should follow from now on. The Cement Association functions largely to increase the use of the product of that industry, but with that goes the constant effort to build up the intelligent and economical use of its Portland Cement to the end that the customers of their members may carry on their construction work with the least expense possible. Many times the activities of the Portland Cement Association would seem to curtail rather than to increase the use of their product, by finding ways by which more economical construction work can be carried on. You will readily see, however, that this is only apparent and that in the end the industry benefits through such a course.

In the use of sand and gravel we have developed an industry in a surprisingly short time to a point where it is one of the largest industries in the country. Are our customers using our product intelligently, or are they still using the materials we produce on the basis of any old sand or any old gravel, in spite of the specifications we have to meet and in spite of the extra cost of producing a high class product? It is now up to this industry through this National Association to so educate the users of our materials that they will benefit from our high class product and will learn that they can not afford to use unprepared materials.

We should carry on this work through the preparation of numerous articles, technical, education and descriptive. We should secure the continuous publication of these in the many magazines and periodicals that will reach the users of sand and gravel.

We should proceed in the prepara-

tion of a film for general use by the membership showing the origin, preparation, and use of properly prepared sand and gravel for the various purposes for which it is intended.

There is, and through the nature of things there should be, a wide variation in the specification for our materials. We should have the resources of a competent technical staff who can aid in the preparation of the best specifications to meet the different conditions in the different sections. These specifications should read not only to admit the materials available, but should require the materials found to be most efficient under the circumstances. These would consider the complete cost of the aggregate, including waste as against the economy to the user.

Our members should be assisted through the combined experience of the industry to meet their requirements in the most effective way.

Our Engineering Department should follow the research work of other agencies to insure the fair and representative treatment of our product. I have in mind here the investigation of the fire resisting qualities of concrete in which I understand results unfavorable to gravel were developed. These were, no doubt, due to the fact that the gravel chosen was not representative. It is essential to our industry that such results be anticipated and damage to the industry due to such incomplete though well intentional reports be avoided.

I do not doubt but that as time passes we will grow to such strength that we can conduct our own research work either in our own laboratory or by working with other agencies.

Continued study should be available to us from a national viewpoint looking toward the development of uses and markets for the by-products in our several operations, for it is by so doing that the average selling price can be reduced without danger to the producer and the recognized economic requirement of reducing cost be met.

I believe we should look not so very far ahead to the time when our Association may embark upon a national advertising campaign of education.

The large majority of the users of sand and gravel are not as yet well enough informed to get the full benefit of our materials and do not yet appreciate fully the advantages to be gained in buying only properly prepared materials such as the members of this Association have to offer. In the larger promotional activities and those that must be developed in the future, this Association will be a necessary part of the business life of all producers, east and west, on the seaboards and of the great inland plain. I hope that we may proceed and progress, looking forward thruogh this convention to the future rather than considering the mistakes and difficulties of the past.

Mr. J. L. Shiely, Secretary Treasurer of the Association presented a financial report showing the assets to be above $10,000 without any outstanding liabilities.

"Winter Concrete Construction" was the title of a paper read by Mr. H. S. Wright of the Portland Cement Association. Mr. Wright presented an interesting paper on a subject that sand and gravel producers should be vitally interested in. During his address he said,

The subject of winter construction is one in which we should all have a serious interest because of its direct bearing on the economic aspects of our respective lines of endeavor, especially where concrete is involved. It needs no windy argument or bulky volume of statistics to demonstrate just how far-reaching and universally beneficial would be the establishment of an extended and better balanced demand for building materials. Such facts are self-evident and the major portion of our interest should properly be centered on the means of accomplishment. Fortunately we are not alone in the desire to "iron out" the peaks in the construction load for such great organizations as the Federal Government, the Associated General Contractors of America, the American Society of Civil Engineers, and the technical press have for some years been directing an attack toward this same objective. As more and more organizations ally themselves with the movement for a twelve month construction season, the nearer we will approach success until the very impetus of the thing will carry it over definitely and for all time.

An enlightening address on "Workmen's Compensation" was presented by Mr. J. A. Gunn, President of the Employer's Mutual Casualty Association of Iowa. Mr. Gunn appeared to be very much disturbed about the activities of the labor unions in the various states concerning the passage of laws affecting workmen's compen-

sation. It seems that when bills concerning workmen's compensation are being considered in the various legislatures, the labor unions send representatives to see that their interests are protected. Their attitude is to get all they can for labor. There is nothing to criticize in that. The inactivity of the employers is to be criticized. They should protect their own interests. Insurance costs do affect the cost of operation and all costs should be reduced wherever possible. The brief review of the history of workmen's compensation presented by Mr. Gunn was most interesting and also enlightening. An important point brought forth was that conditions of industry are changed. As the responsibilities of the employer increase as regards the public, his responsibilities to labor should decrease. The responsibilities of the employer to the public have rapidly increased, and unfortunately his responsibilities to the employee have not decreased in anything like the same proportion.

"Statistics show that forty per cent of all industrial accidents that cause disability do not arise out of either the fault of the employer or the employee; forty per cent more are considered the fault of the employee himself, leaving twenty per cent that might be attributed to the fault of the employer. At the present time, however, the employer's faults have been reduced so that it is even much less than the balance of twenty per cent, because they have been using safeguarding in all of the factories and things are getting down to a more stable basis so far as the employer is concerned, and the employee himself has during that period of time been more and more responsible for the accidents that arise out of employment. Our experience shows that in almost sixty per cent of the cases we come in contact with they are really the fault of the employee himself."

"The decisions handed down by the courts nowadays are to liberalize the laws to a far greater extent than was contemplated by the original authors. Day by day new decisions are handed down increasing benefits never intended under the law, thereby increasing the cost of insurance year by year. Every year losses are increased, and unless employers wake up to the realization of what they are up against, you will be carrying life insurance and old age pensions under your workmen's compensation law."

A series of short talks by various members of the Association proved to be one of the most interesting phases of the program. Mr. Alex W. Dann of the Keystone Sand and Supply Company, speaking on the subject, "Making Super Sand from Gravel," said:

"The proportions of sand and gravel produced in the rivers of the Pittsburgh district are not balanced with the demand, meaning that there is surplus of gravel. This natural situation of the deposits in the river bed is aggravated by the presence of a very large commercial slag industry and a large production of crushed stone.

For years gravel has been washed back in the rivers to secure the sand. It is worse than wasted, because its presence there in the bottom of the river prevents a complete recovery of the very valuable sand. Much time and money has been used up to stop this waste by designing some plant which will make sand from this gravel. With no similar plant as a guide, our company, after experimenting with many crushers, built a large plant to accomplish this purpose. Rolls only are used in the reduction. They come three in number. The primary rolls are fifty-four inches by twenty, and the others are thirty-six by thirty. Up to three inch, or slightly larger material may be fed to this plant, and the final product passed a screen with a three-sixteenth inch square opening, after three breakdowns, with provision for recirculation, three screens, three rolls and three bucket elevators which are driven by a 250 horse-power motor, which is of more than ample size for the work.

The process is wet, which means no dust, more capacity, and a cleaner product, dewatering being accomplished by elevators. We surmise that the presence of water may lessen the wear. As to the product, it makes a mortar and a concrete of exceptional strength when compared with the strength obtained from standard sand. It is free from loam and coal. Even if these things exist among the gravel, we have not yet found a colometric test other than clear.

It is not recommended for brick or plaster work. While it suffers somewhat in comparison with natural sand as to workability, so does natural sand suffer when compared with foundry sand. Ordinary care can

and does make very excellent concrete.

As to process, while it is not perfect, it has demonstrated its commercial success. Experience is pointing out readjustments to reduce wear, increase capacity, and further improve the cost.

The time is coming and the date we do not know when building in the Pittsburgh district must be done either with inferior sand, with superior sand shipped in with a very high freight rate, or with manufactured sand, because the natural sands in the rivers will be gone."

Mr. W. E. Rogers discussed "Methods of Repairing Bad-Order Cars and Relief from Inadequate Equipment." Mr. A. P. Burke, Atlanta Sand and Supply Company, discussed the manufacture of concrete brick. There were many in attendance much interested in the subject of concrete brick. A sectional meeting was held on Tuesday morning. In discussing the manufacture of concrete brick Mr. Burke remarked:

"It is my opinion that the products business offers a splendid opportunity for the installation of a small plant with provisions of extensions to meet future demands. If you contemplate manufacturing face brick, it is my opinion you will find that no concrete face brick has been successfully and commercially manufactured without the use of the Shope patented process. Since we have been operating we have made many tests and experiments; so far we have found no method by which the face of a brick can be water-proof, coloring material used and the variation of textures gained without the use of the Shope method.

The proposition of using waste materials in some cases proves disappointing. In the case of screenings, particularly of crushed materials, they do not always contain the proper grading to give the desired strength of the minimum amount of cement. We have found some of these materials can be made satisfactory by re-screening, using everything retained on the screen, and by adding the proper natural sand you get the desired grading.

We also find that it is not economical to use a material that does not contain the proper fines and correct percentages of fines, as the additional cement necessary to bring your product up to the requirements of specifications makes your cost excessive.

"Loading Materials in Freezing Weather" was discussed by Mr. R. Snoddy, Coon River Sand Company. In his discussion he said:

"I would advise you to construct your plant with sufficient capacity to take care of your immediate needs during the summer and accumulate storage sufficient to load out all of your orders in the wintertime, and in that way avoid any operation in the winter and still be able to accommodate your trade the year 'round. That brings up the question of how best to do that. If you are constructing a new plant, my advice would be to build it on the tunnel system, and do all your loading, winter and summer, from the tunnel, and don't have any bins at all. If a car shortage holds you up for a week or two at a time or if there are no orders, why your production end keeps steadily grinding along and piling it up. I have seen some of those tunnel affairs that would accommodate a whole year's run for one of my plants. The fellow with that kind of equipment is well fixed to take care of the situation at any time of the year, because his stuff doesn't freeze in the bottom of that pile. It, of course, should be provided with drainage.

If a fellow has the ordinary type of bin with the screens up on top, if he is operating from a dry pit, he has already passed up a whole lot of his grief. It isn't a very big job to build a temporary structure over his screens covered with tar paper or cover the side of his bins with tar paper and put in a little boiler of about fifty horse-power—it doesn't need to be a very high pressure affair—and put steam pipes in your bins. In that way you can operate in the winter time; you can only operate a portion of each day, you can't start early in the morning and run until late at night the same as you would in summer, but during that part of the day when the weather permits, operate and accumulate sufficient in your bins and leave it stand over night, and with the steam pipes to keep it warmed up your screened gravel will practically dry out. The next morning before you start operating, load this material out into your cars; it is not only practically dry, but it is warm enough that it isn't going to get completely cooled off for about twenty-four hours in zero weather, and it can reach its destination and be unloaded without any difficulty.

Now your sand is a different proposition. You can't sufficiently dewater that so you can dry it out. It is advisable to have two sub-bins, as we call them, at your plant. Make an excavation and put down piling of posts and board them up so as to have a bin down underground with the drainage going back to some other source. You have two of those; the one that you load today you unload tomorrow, and vice versa, and by picking this stuff out of the bin with the clam shell, you put it onto the car loose. Now loose sand doesn't freeze hard. Quite moist sand, if it is put on the car loose, can stand zero weather for a couple of days and be unloaded with very little difficulty.

Mr. A. E. Frosch, East Liverpool Sand Company discussed, "What Discount Rate for Prompt Collections." While the Association has nothing to do with the price charge for sand and gravel, the discussion relating to discount rates and their effect on prices proved interesting to every operator. Mr. Frosch said:

"The producers working and selling in one territory should get together and determine on a standard rate of discount in their district, arriving at that on this basis: selecting first of all a price which you know to be a fair price, allowing you a reasonable profit, and adding to that price the amount that you wish to allow as a discount. This, of course, takes care of the responsible contractor, a man with whom you actually want to do business, it places no penalty on him because he gets it back. The other fellow who is irresponsible and doesn't pay his bills promptly pays you only what is the legal rate of interest in your state, and you are taken care of in that case as you should be."

The Tuesday afternoon session was started with an address by Mr. N. D. Belnap, "Weighing of Materials and Legal Obligations of Carriers with Respect to Installation of Track Scales." Mr. Belnap discussed the law with respect to determination of weights of freight by carriers and the legal obligations of the carriers with respect to the installation of track scales. His discussion was confined largely to what the Interstate Commerce Commission has stated and the interpretation of the rulings.

Mr. L. A. Boulay, State Highway Director of Ohio, gave a very interesting and informal talk on the highway problems of Ohio. Discussions of a number of subjects in an open forum brought out some valuable ideas. The following are some of the subjects discussed:

Improving personnel (man-power) of this industry.

Getting material from bank to conveyor belt under main hopper.

Standardized sizes for sand and gravel.

Economical winter storage of sand and gravel.

Costs and advantages of large sized storage stocks.

Overcoming river cutting into a bank.

Unique system of plant haulage.

Pumping with centrifugal operation.

Conveying and elevating.

Screening and washing.

Slackline cableway excavating.

Crushing oversize.

The Wednesday morning session was opened with an informal talk by Mr. R. H. Ford, Assistant Chief Engineer of the Rock Island Railroad, on "Gravel as Railroad Ballast." This talk proved to be the most spirited of the convention. Many broad charges relating to the inefficiency of the producer were made by Mr. Ford, and an interesting scene was avoided by Mr. Ford's departure before any producer had an opportunity to ask Mr. Ford any questions or to answer his complaints.

Mr. Charles Dillon, Assistant to Mr. Markham, Chairman of the Western Railway Presidents' Assosiation, made an appeal in an informal talk for the support in opposing certain legislation before Congress affecting the railroads. The Howell Barkley Bill and the Gooding Bill were discussed and explained. Mr. Dillon urged that these bills be opposed as they increased the difficulties of the raliroads and would indirectly affect transportation.

The reports of the Car Demurrage Committee, the Ballast Committee and the Board of Directors were read and approved. The Association approved the report of the Board of Directors which recommended the activities for the year 1925. The activities approved are the promoting and extending the uses of high-grade sand and gravel; the preparation of materials to meet Federal, state, county and city specifications; the proper consideration of car supply, demurrage rules, minimum weights and other transportation matters; the ef-

fort to cancel Kelly's Tariff 228; active consideration of securing more equitable compensation insurance; that the Executive Committee hold regular bi-monthly meetings at various points throughout the United States; that the Association Bulletin be increased in size and that the Association continue to cooperate with other organizations in matters pertinent to the success of the sand and gravel industry.

The officers elected for 1925 were as follows: Mr. John Prince, President; Mr. Hugh Haddow, Vice President; Mr. J. Shiely, Secretary-Treasurer; and three new directors, Mr. H. S. Davidson, Mr. George Rogers and Mr. Charles H. Miller.

The National Sand and Gravel Association adjourned its ninth and most successful convention at one o'clock Wednesday, January 6.

Cement Products Standardized

At a meeting of a number of representatives of leading companies interested in cement and concrete products manufactured in Chicago recently concrete blocks, concrete building tile and concrete bricks were reduced to standard sizes. These sizes will become standard in production at the factories in June, 1925. This action has come as a result of the increasing popularity and utility of cement products as buildings units.

R. M. Hudson, chief of the division of simplified practice of the United States Department of Commerce attended the meeting and took an active advisory part in the standardization of the building commodities.

For concrete blocks, a uniform height of 7⅞ inches, with a minus tolerance of ⅛ inch and a length of 15⅞ inches, with a minus tolerance of ⅛ inch were adopted for the standard widths of 6, 8, 10 and 12 inches, the widths subject to a minus tolerance of ¼ inch.

For building tile a face of 5 by 12 inches was adopted for widths of 3¾ inches, 8¾ inches and 12¾ inches with a plus or minus tolerance of 3 per cent on all dimensions.

All concrete brick. rough and smooth, are to be of a standard size, 2¼ by 8 inches.

Partition tile was standardized as 12 by 2 inches with 3, 4, 6, 8, 10 and 12-inch depths. subject to a plus or minus tolerance of 3 per cent on all dimensions.

Concrete Products More Popular

Statistics recently given out by the Portland Cement Association indicate a growing popularity of concrete blocks and building tiles. According to these figures there were more than nine times as many blocks used in 1924 than in 1920. In 1920 there were 50,000,000 blocks used; in 1921 there were three times as many used, or 175.000.000; in 1922 the number increased to 297,000,000; in 1923 to 385,000,000. This was considered a record production, but the year 1924 showed 462,000,000 concrete blocks produced and sold.

These figures are equivalent to 500,000,000 square feet of wall space,—slightly more than is provided by the national output of common brick which totalled 6,000,000 bricks in 1924. Although the strongholds of block construction in the past have been in the smaller cities and rural localities, say leaders in the construction industry, concrete blocks are now supplanting common brick to a great extent in 45 of the 50 largest cities in the country. New York naturally leads in this consumption because the surrounding territories of Brooklyn, Queens and New Jersey are considered the center of the block industry of America, producing something over 100,000,000 blocks per year.

Standardizing Concrete Blocks

The Concrete Products Association of Detroit, Mich., whose members manufacture a variety of concrete articles, especially concrete blocks and building tile have, through concerted effort, not only standardized their product as to kind, but also as to quality.

This assoication employs an engineering staff whose duty it is to pass upon the materials that enter into the various manufacturing processes and to see that quality is maintained at the source. Rigid inspection is continually being made of the completed product.

"Standardizing our products assures greater economies in manufacturing and guarantees to the buyer an exceptionally high and unvarying quality," says M. E. Von Mach, Jr., a member of the publicity committee of the association.

The Profit and Loss Statement

Written Expressly for PIT AND QUARRY by D. J. HUTCHINSON.

IN A PREVIOUS article we discussed the methods of preparing the balance sheet so that the significant facts with reference to the financial position of the business would be made readily apparent. It is important that the same care be given to the preparation of the profit and loss statement. The object of these statements is to convey certain information and they should be prepared so that they can be easily interpreted and so that the information which they are intended to convey will be readily obtained by anyone reading the statement.

The Statement of Income, Profit and Loss or Earnings Statement should be arranged to bring out all of the important factors that have influenced the net profit for the year. If this necessitates a statement that is too long and bulky to go on one sheet the use of supplementary schedules may be resorted to, supporting the principal items on the statement. The form of Profit and Loss statement recommended by the Federal Reserve Board is shown in figure 1.

The Earnings Statement should always start with the item of gross sales, and any deductions thereform in the nature of discounts, allowances for returned goods, etc., should be shown on the face of the statement. These figures are often very significant and to omit them from the statement is to fail to bring out important information. The amount of cash discounts allowed in relation to the gross sales for example is a good indication of the credit conditions and the promptness with which customers are paying their bills. An excessive amount of returns and allowances again indicate the chance that there may be something wrong with the goods or with the service and should be a warning to anyone reading the Earnings Statement.

The Earnings Statement therefore starts with the gross sales, which less the deductions in the nature of discount allowances, etc., gives the next important figure which is the net sales. This is the figure that should be taken as 100 per cent in computing the percentage relation of the various items on the earnings statement. The reason for this is that the cost of goods sold, the next important figure on the Earnings Statement represents naturally only the cost of the goods that have actually been sold, returned goods being deducted at cost from the operating accounts and returned to the inventory. Therefore the cost of goods sold should be expressed as a percentage of the net sales rather than as a percentage of the gross sales, which is accomplished by taking the net sales as 100 per cent. The relation of net sales to gross sales and deductions is then shown by expressing these amounts also as a percentage of net sales, thus, for example, gross sales maybe 104 per cent and deductions 4 per cent of net sales. Moreover the net profit is realized on the net rather than the gross sales and should therefore be expressed as a percentage of net sales.

Ordinarily the cost of goods sold can be conveniently shown on the face of the Earnings Statement as in the illustration though in some cases it may be necessary to use supplementary schedules. These can be used advantageously where prime costs and gross profits are obtained by departments to show the departmental figures using only the combined figures in the Earnings Statement.

The cost of goods sold should include only the prime cost. In a merchandising business this is the merchandise cost of the goods sold obtained by the usual formula of opening inventory plus purchases less closing inventory. In a manufacturing business the cost of goods sold includes the manufacturing costs as well, and where manufacturing or processing operations are involved there should always be a supplemental statement of manufacturing costs.

The third section of the Earnings Statement covers the selling and administrative expenses, which deducted from the gross profit leaves the net operating profit.

To this is added the financial income less the financial expenses. These include cash discounts earned, interest earned, interest and discount paid, etc. Cash discounts allowed may also be included in this section if not included in the deductions from gross sales. The latter treatment

however is often preferred as it brings out more clearly the relation between discounts and sales as an indicator of credit conditions. The balance is then the net profit (or loss) carried to surplus for the year.

Often items of extraordinary profit or loss such as those arising from the sale or disposition of fixed assets are included in the Earnings Statement. If included they should be shown as in the form recommended by the Federal Reserve Board, at the bottom of the statement after ordinary business profits have been computed. In many cases, however, it is better to reserve items of this character for a separate statement called the "Analysis of Surplus Account" wherein all the changes in the surplus account during the year are shown, including dividends and federal taxes paid, etc.

This leaves the Earnings Statement a statement of earnings purely and no one will be misled into assuming that the earnings are greater or less than they are owing to the occurrence of extraordinary profits or losses.

It is unfortunate that there is so much confusion of terminology in income statements. The terms profit, income, earnings and revenue are used interchangeably as though they were synonymous, whereas often they are used to mean very different things. Net earnings for example is usually applied to the amount determined after the deduction of depreciation. In some cases, however, the term is used to indicate earnings before any allowance for depreciation. It is important that the income statement show exactly the nature of each item since there is no standard terminology to fall back on and the reader may be easily misled by certain terms unless the nature of the item is made perfectly clear.

Even the statement itself is known by many names. One authority* recommends the use of "Income Statement" to the exclusion of other titles. The Federal Reserve Board in publishing its recommended forms for financial and operating statements has endeavored to crystalize the sentiment for standardized terminology which would undoubtedly be of great benefit if it could be achieved.

In preparing or studying the income

Form of Income Statement Recommended by Federal Reserve Board

Gross sales ..... $
Less outward freight, allowance, and returns .....
Net sales .....
Inventory beginning of year .....
Purchases, net .....
Less inventory end of year .....
Cost of sales .....
Gross profit on sales .....
Selling expenses (itemized to correspond with ledger accounts kept)
Total selling expense .....
General expenses (itemized to correspond with ledger accounts kept)
Total general expense .....
Administrative expenses (itemized to correspond with ledger accounts kept) .....
Total Administrative expense .....
Total expenses .....
Net profit on sales .....
Other income:
Income from investments .....
Interests on notes receivable, etc. .....
Gross Income .....
Deductions from income:
Interest on bonded debt .....
Interest on notes payable .....
Total deductions .....
Net income—profit and loss .....
Add special credits to profit and loss .....
Deduct special charges to profit and loss .....
Profit and loss for period .....
Surplus beginning of period .....
Dividends paid .....
Surplus ending of period .....

*R. H. Montgomery, Auditing Theory and Practice, Vol. 1, page 298.

statement there are several factors that should receive particularly careful attention.

One is the treatment of bad and doubtful accounts. It should be determined that adequate provision has been made for uncollectible accounts and the amount credited to the reserve for this purpose should be deducted from the earnings for the year. The treasury department now allows this practice where it is consistently followed and it is no longer necessary to write off only the actual debts ascertained to be uncollectible during the year. Such deductions whether based on a reserve or on actual losses should be taken in the selling expense section of the income statement.

Another important item to watch for is the interdepartmental profits which should be held in reserve until actually realized through bona-fide sales. Mere transfers of merchandise from one department to another at fictitious prices do not result in profits and such items should not appear on the Earnings Statement.

Increased valuations through appraisal or profits arising from the sale of permanent assets should be carefully kept out of the operating profits or the comparative value of the latter with other periods will be destroyed and they will not appear in their true light. Similarly extraordinary losses as from fire, etc., not protected by insurance should be treated as separate items and not offset against the operating profits.

Federal Roads and Buildings

Coolidge Discountenances Special Government Buildings Plan. Federal Aid Roads Total 8,620 Miles During Year

By Our Washington Correspondent

CHANCES OF CONGRESS entering upon a building program at the short session, or at next December's session, were lessened when it became known that President Coolidge has expressed his disapproval of such expenditure of government funds. The position of the Chief Executive is said to be based on his belief that the overwhelming majority of votes cast for him reflected the country's approval of his program, one of the principal planks of which is economy in governmental operation.

It is possible, however, that a $50,000,000 program for the District of Columbia will be entered upon to replace the present temporary structures housing various government activities, and serving as storehouses for valuable government papers, with modern fireproof office buildings. Some of the members of Congress are inclined to be critical of the President's stand, declaring that the government would save money in erecting badly needed buildings outside of Washington where now it has to lease property.

In spite of the known opposition of the president to extensive building for the present, a six-year building program involving the expenditure of $150,000,000, is proposed in an omnibus buildings bill introduced in the House by Representative Elliott, of Indiana. The bill provides for housing needs of the federal government throughout the United States and the territories. Mr. Elliott made it clear that his bill is not an administration measure. Whether legislation of this character can be put through at the present short session is doubtful. The Elliott bill would authorize the Secretary of the Treasury to purchase land and put up public buildings for accommodating courts, post offices and other branches of the government service.

Progress in the construction of federal-aid roads resulted in the completion of 8,620 miles during the fiscal year ending June 30, 1924, according to the Bureau of Public Roads. This brings the total of roads completed with federal aid since 1916 to 35,157 miles. Work was in progress at the end of the fiscal year on 15,350 miles and these roads were reported as 56 per cent complete in the aggregate.

As in previous years, the mileage of gravel roads completed exceeded the mileage of any other type of construction, the year's total including 3,353.8 miles. Other types were completed, as follows: Graded and drained, 1,604.8 miles; sand-clay, 888.2 miles; water-bound macadam, 106.7 miles; bituminous macadam, 566.6 miles; bituminous concrete, 252.1 miles; concrete, 1,667.9 miles; brick, 169.4 miles. Bridges more than 20 feet in span completed during the year aggregated in length 10.8 miles.

The final designation and approval of the federal-aid highway system in all the states is an event that will be recognized as time goes on as one of the milestones of progress in the

improvement of the highways of the country, the Bureau argues. The map of the system presents a definite plan for the improvement of the main highways of the nation, a plan that it is possible to carry out in a period of not more than ten years, and which, in that limited period, will result in a connected system of arterial highways that will permit unobstructed highway transportation between all cities of 5,000 population or larger.

The duty of constructing the connecting roads which are needed to give access to the main system rests with the states and counties. The roads on the system have been and are being improved by the states with the assistance of the federal government, which pays up to 50 per cent of the cost.

National Concrete Products Assn. Meets in Milwaukee

The annual convention of the National Concrete Products Association will be held in Milwaukee on January 28, 29 and 30, plans for the meeting have been announced by D. R. Collins on December 31.

It is expected that the meeting will be the largest gathering of concrete manufacturers ever assembled in the United States. Keen bidding for the convention was registered by Milwaukee, Dallas, Cleveland, Pittsburgh and Chicago. Among the leaders of the nation's concrete industry who will attend are W. D. Allen, Chicago; J. H. Bailey, Atlanta; F. J. Stroub, New York; H. H. Fillmore, Los Angeles; and H. C. Davis, Washington. In a letter to Mr. Collins, Wallace R. Harris of Chicago, president of the association, praised Wisconsin manufacturers for their progress in manufacturing.

Illinois Sand-Gravel Meeting

The Illinois Gravel and Sand Association held a meeting at Galesburg on December 29 where matters of concern to the organization were discussed. Nine or ten delegates from outside the city attended. These sessions are held every two or three months.

Due to the fact that the State Board commission admits of the use of sand and gravel in the construction of state roads, the demand for the product the coming year, is likely to increase, and in this the meeting was interested. But all the product, it was stated, is subjected to rigid tests, and inferior products are excluded.

Standardizing California's Minerals

Non-utilization of California's structural minerals is largely due to the fact that the producers have failed to standardize their industry. To remedy this condition the Sacramento Chamber of Commerce has called a state-wide conference of structural mining producers and manufacturers of building materials to be held in conjunction with the industrial exposition in this city during the week of January 26.

Not only has California the structural minerals in immense quantities, but it has practically every mineral used in industry as well, in sufficient quantities to keep millions of workers busy in manufacturing plants, says the *Stockton, (Cal.) Record.*

New Orville-Simpson Screen

A bulletin has recently been issued by The Orville Simpson Company of Cincinnati, Ohio, describing The New *Rotex* jumbo-screen, a screen for handling crushed rock.

This screen is described as being big, rugged, smooth-running and non-clogging. It is level and of the gyrating type, and has a screen surface 8 ft. wide by 12 ft. long. It is built of structural steel and steel castings, and weighs nearly three tons. It has the same non-clogging feature employed successfully in their smaller screens.

Pioneer Company Organizes

The Mansfield Engineering Company has been reorganized under the name of "Pioneer Bucket Company" as successors to the Mansfield Engineering Company, and manufacturers of the Pioneer Back Dump Bucket—and other slack line accessories.

This move was brought about in order to separate the Pioneer Slack Line business from the Mansfield Engineering Company contractors.

The office address, 1011 Fletcher Building, Indianapolis, Ind., will remain the same, but be a complete and distinct organization from the contracting company—but Mr. H. A. Mansfield will control both companies as heretofore.

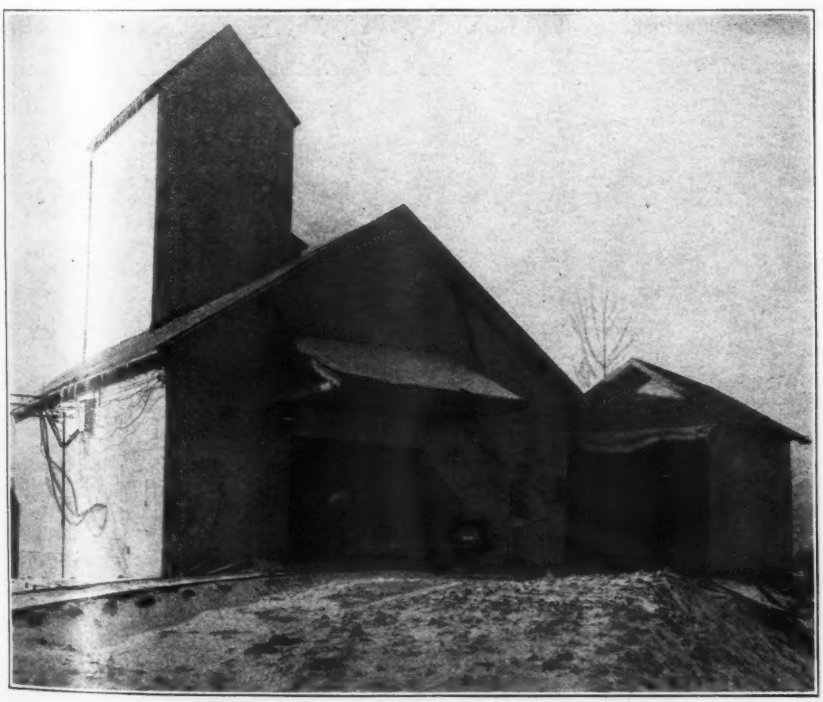
Making Marble Concrete Aggregate Successfully in Massachusetts

Unique Plant at Ashley Falls Producing Excellent Aggregate Fracture of Stone Crushed Determines the Quality of Product

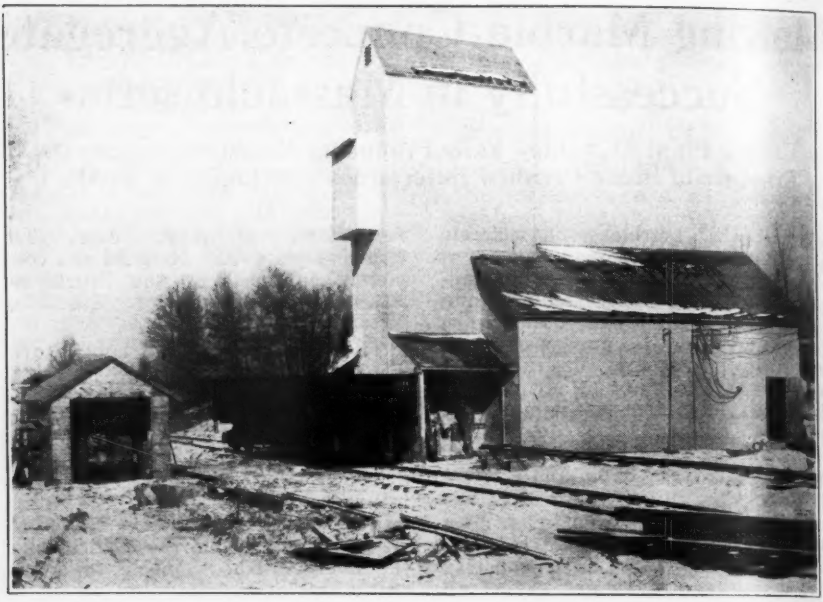
CRUSHED marble as a concrete aggregate in the manufacture of artificial stone has the great advantage of being easily "tooled" compared with granite or other hard stone, and also its purity of color makes it particularly desirable for most uses. The plant of Mr. Donald U. Smith is unique as it not only produces an excellent quality of crushed marble, but accomplishes this purpose in a very simple and efficient manner.

The marble is quarried in an open pit. Air drills are used and the stone is loaded into 3,000 pound capacity side dump cars which are hauled up an incline by an American electric hoist, operated by a 20 H.P. motor, to the crushing plant located about 40 feet above the quarry floor. The crushing plant was designed and completely equipped by the Sturtevant Mill Company of Boston, Massachusetts.

The cars dump into a hopper over a 10x20 jaw crusher which is set to reduce the marble to 2½ inches and finer. The crusher discharges into an inclined elevator which carries the material directly to a No. 2 motor driven "open door" rotary crusher set to produce ¼ inch stone. The rotary crusher discharges into a No. 3 all steel "open door" elevator which takes the finely crushed marble to a two unit, three deck moto-vibro screen located on top of a bin or hopper. The first screen is clothed to make a ¼-inch product and oversize; the sec-



Quarry Side of the Donald U. Smith Crushing Plant Showing Quarry Car and Car Hoist.



Railroad Side of the Donald U. Smith Plant.

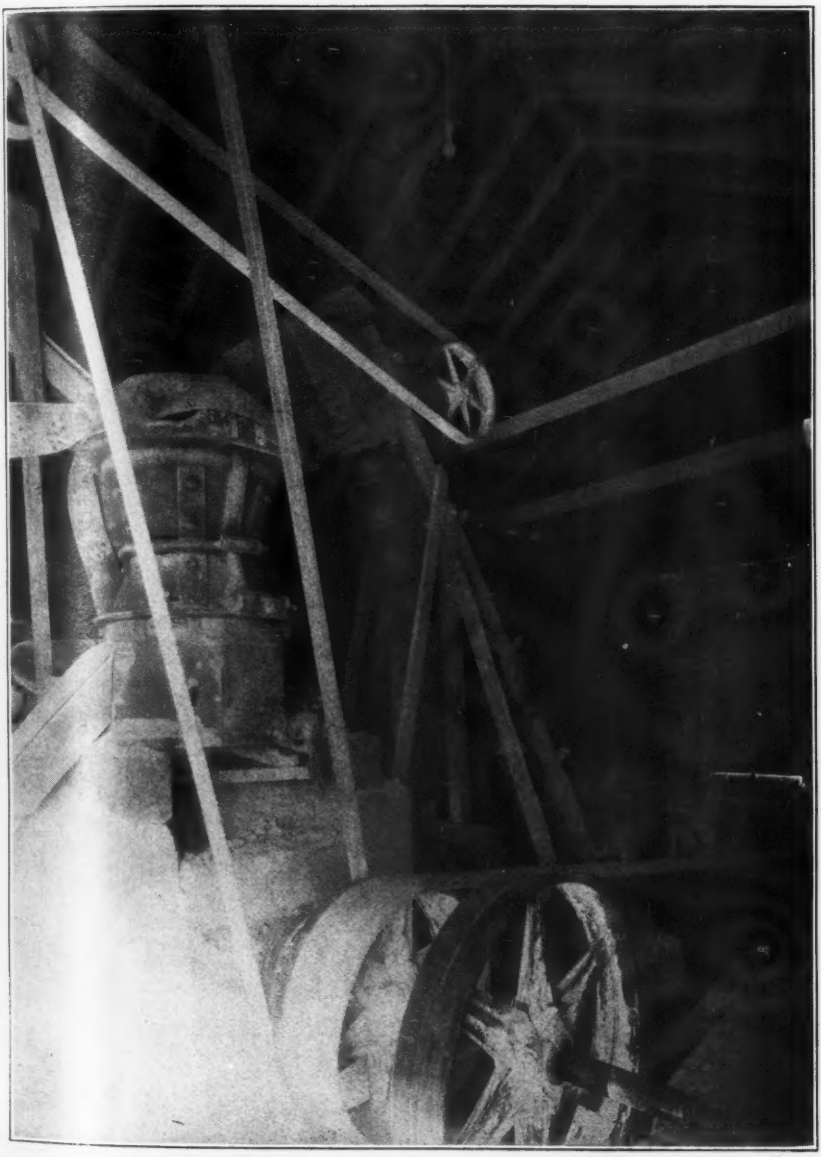
ond screen is clothed with 10 mesh wire and acts as a scalper for the fine screen which produces an output of 98 per cent through 80 mesh.

The oversize from the first screen passes by gravity back to the rotary

One View of the Smith Quarry.

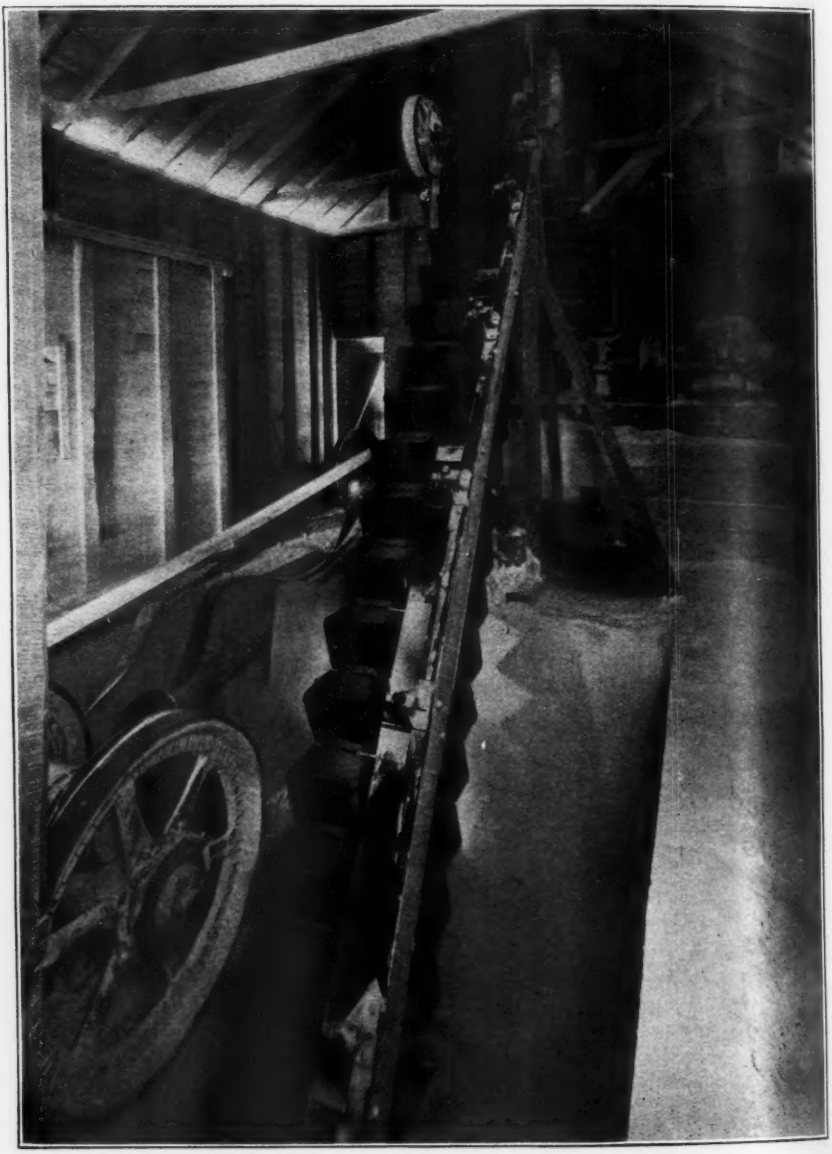
crusher for further reduction. The intermediate product falls into a bin from which it is either discharged directly into a car or can be drawn off through a spout into trucks or bagged as desired.

The fines pass from the screen discharge into a hopper from which they are bagged. This plant is producing as high as 11 tons of ¼-inch and finer stone per hour and is capable of even greater output, but is limited at the present time to the capacity of the quarry. A 25 H.P. motor drives the jaw crusher and both elevators, another 25 H.P. motor drives the rotary fine crusher, and a 2 H.P. motor operates the moto-vibro screen.



Inside View Showing Jaw Crusher, Elevator, Rotary Crusher with Direct Motor Drive and Vertical Enclosed Elevator.

This plant was erected to supply the greatly increased demand for crushed marble and it is interesting that with Mr. Smith's old plant consisting of a 10x16 crusher, 32x12 revolving screen, and a set of 24x12 crushing rolls, he was only able to produce 5 tons per hour. Also the quality of crushed marble from the new installation is so much superior that his customers are demanding it to the exclusion of his former output, so that it will be necessary to junk his old plant in the Spring, and add another unit to his new plant.



Interior View Showing Jaw Crusher, Inclined Elevator and Rotary Crusher.

The Economics of Rate Making

Written expressly for PIT AND QUARRY by JOSEPH DONNELL

VI

This is the last article of a series of six on this subject by Mr. Donnell. The first article appeared in the November first issue of Pit and Quarry and the successive articles followed in the succeeding issues. Heretofore information and data on this subject have been scattered and inadequate. Some of the subjects covered in this series of articles include:

Cost of Service
Elements Affecting Cost
Operating Costs
The Cost of Service Principle
Value of Service
Volume of Movement
Hazards of Handling
Value per Unit
Stage of Manufacture
Special Equipment
The Character of a Commodity
Commodity Relationship
Railway Competition
Commodity Competition.
Prior Rates
Miscellaneous Factors
Use of Commodity Not a Factor in Rate Making.
Distance as a Factor in Rate Making
Legal Factors—Editor.

MANY of the legal phases of rate construction, particularly the interpretation of court decisions have been set forth with remarkable clarity and conciseness in Corpus Juris, paragraphs 656 to 669 inclusive. Some of the more pertinent of these statements are here included.

The fact that a line of railroad is operated in connection with other lines owned by the same company, but under separate charters whereby the earnings of such line are increased and its operating expenses reduced does not prevent its being considered as a separate and independent line for the purpose of determining the reasonableness of the rates thereon, fixed by the state, full consideration of the joint operation being given when the road is credited for the increased business and reduced expenses.

Joseph H. Donnell.

When by legislation and consolidation a railroad which was originally all in one state becomes consolidated with other roads in other states and the state originally incorporating it enacts laws to regulate the rates of the consolidated road within its borders, the proper test as to the reasonableness of these rates is as to their effect on the consolidated line as a whole.

The reasonableness or unreasonableness of rates prescribed by a state for the transportation of persons and property wholly within its limits must be determined without reference to the interstate business done by the carrier, or the profits derived from it. Interstate traffic cannot be made to bear the losses of intrastate business, nor vice versa. The argument that a railroad line is an entirety, that its income goes into and its expenses are provided for out of a common fund and that its capitalization is on its entire line within and without the state can have no application where the state is without authority over rates on the entire line and can deal only with local rates and make such regulations as are necessary to give just compensation on local business.

The Supreme Court of Virginia has ingrafted an important limitation on the foregoing principles and holds that it has no application where the road is built, maintained and operates essentially for interstate purposes, and where the interstate business is incident merely and confessedly too inconsiderable to render

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feasible the fixing of a reasonable maximum rate with full reference to it.

If a terminal charge is just and reasonable, it cannot be condemned nor the carrier required to change it on the grounds that taken in connection with prior charges of transportation over the lines of the carrier or of connecting carriers, the total charge to the shipper is unreasonable; that which must be corrected and condemned is not the just and reasonable terminal charge but those prior charges which must of themselves be unreasonable in order to make the aggregate of the charge from the point of shipment to that of delivery, unreasonable and unjust.

Long acquiescence by railroad companies in rates fixed by a railroad commission will in general raise a presumption that the rates are reasonable, but the mere performance of services for a rate fixed by the commission will not of itself justify the conclusion that the rates are reasonable where the legislature has prescribed a penalty for violation of the rates fixed.

To require carriers to perform services for less than cost amounts to confiscation and is unlawful. To constitute a rate confiscatory it is not essential that there should be a total deprivation of reward for the use of the carrier's property or a taking of the corpus of the property. If the law renders it impossible to obtain from the use of the property a reasonable and fair return it is confiscatory in its operation and effect. To render rates unreasonable it is not essential that they should amount to practical confiscation, and rates are not necessarily reasonable when they allow any dividends however small.

1. General Rule. In the absence of extraordinary conditions and circumstances justifying it, the fixing of rates at a sum less than or not exceeding out of pocket expense of the service, is unreasonable and invalid. A carrier is entitled to receive compensation beyond the mere cost for that which it does, and it has been held that where a carrier is operating at a loss, which it can reduce by charging rates in excess of the requirement of a special statutory provision regulating rates, but within the limits which the law would otherwise permit and can in this manner obtain a proper return on its capital it would be relieved from compliance with the statutes, under a constitutional provision that the legislature can alter an existing charter in such a way that no injustice shall be done to incorporators. **No. 2. Limitation of Rule. Para. A. Unprofitable rates for a particular service.** While it is recognized that the state has a broad field for the exercise of its discretion in prescribing reasonable rates for common carriers within its jurisdiction, and that it is not necessary that there should be uniform rates or the same percentage of profits on every sort of business, it is now settled that the state has no arbitrary power over the rate and may not select the commodity or class of traffic and instead of fixing what may be deemed to be reasonable compensation for its carriage, compel the carrier to transport it either at less than cost, or for a compensation that is merely nominal. The fact that the entire Interstate business shows a reasonable return on the carriers investment does not affect the operation of the rule. In some of the earlier cases some courts had reached conclusions squarely in conflict with this rule, and held in effect that the rate on each and every commodity transported in interstate commerce need not return a profit, provided the entire intrastate business showed a reasonable return on the carrier's investment. But these decisions were based on and assumed to follow decisions of the United States Supreme Court which have been distinguished and explained.

Where carriers construct branch lines within a state through new sections to serve as feeders and to enable them to obtain shorter lines for interstate traffic, they are not necessarily entitled to charge on intrastate traffic rates sufficiently high to enable them to earn a specified percentage on their investment.

While as already shown no part of the earnings or losses from interstate and foreign business can be charged to or against the income account of the carrier in determining the reasonableness of rates for intrastate business, in fixing rates for intra-state traffic, or in determining their reasonableness as fixed, it is essential to apportion the value of the carriers' plant and his operating expenses between interstate and intrastate traffic and the results of the entire intrastate business must be taken into account. In approaching the value of the property employed as

between intrastate and interstate traffic, there should be assigned to each that portion of the total value which corresponds to the extent of its employment in the class of traffic. This apportionment may be arrived at on the basis of comparative revenue.

An apportionment of operating expenses must be taken into consideration the difference in revenue in relation to the cost of the two classes of traffic. It is a well recognized fact that the production of a given amount of revenue is attended with greater cost in intrastate than in interstate business, and this difference furnishes a status by which to apportion the total cost between traffic which is intrastate and that which is interstate.

There is no absolute and definite standard by which it may be determined in all cases what is a fair and reasonable return on the capital invested. It is always a question of facts dependent on the circumstances of each particular case. But the Courts have very generally adopted as the standard of adequate return where the carriers' rates are reasonable, at least as high a measure of profit as the current rate of return on enterprises of a similar character in the localities where the carriers' business is transacted, and a number of decisions fix the minimum return which will be considered adequate as a legal rate of interest in the locality where the carrier is transacting his business. In any event no complaint can be made of a reduction of a rate where to reduce the rate will make a larger profit on the investment than realized by the average investor.

The rates established in accordance with law by legislative Act, state or national, or by the Interstate Commerce Commission or by the Railroad Commission of a State are presumed to be just and reasonable and the burden of proof to show that a rate so fixed is unreasonable, is on the carrier or shipper, as the case may be, who assails the rate as unreasonable through such facts, especially where the rate has been in force for a long period, during which time the traffic has greatly increased in volume, and it has been said that the great difficulty in furnishing data to show unreasonableness of rates established will not excuse a carrier which assails the rate, from so doing where it has in its power to present accurate data which would permit the court to draw correct conclusions. This presumption arises independently of every statute so providing, but it is not conclusive and may be rebutted in proper proceedings had for the determining of the question of reasonableness, as for instance, by showing that the rate is not compensatory. But to overcome the presumption, that evidence must be clear and convincing, every reasonable doubt being yielded in favor of the rate. Mere speculative suggestion as to what might possibly result with no showing of an actual test, is insufficient to overcome the presumption. The fullest disclosure of all material facts must be made. In determining what are just and reasonable rates, great latitude is allowed in the admission of evidence. Voluntary maintenance of rates by the carrier for a considerable period of time is evidence that such rates are reasonable. General evidence as to assessed valuations, without showing the methods of the appraisement, are insufficient either as to the value of property or the apportionment of expenses between interstate and intrastate business. Evidence that the rates are not a fair return on the amount of the bonded debt, capital stock and current debts are insufficient to overcome the presumption of reasonableness of the rates adopted, unless it is also shown that the value of the road equals such outstanding liabilities. But the presumption of reasonableness is embodied where it appears that the state has segregated a commodity, or a class of traffic and has attempted to compel the carrier to transport it at a loss without substantial compensation, even the entire traffic to which the rate is applied is taken into account. Presumption as to reasonableness may also be overcome by admission and pleadings which clearly show the invalidity of the order, or which admits that it is unreasonable and arbitrarily made without evidence or due consideration. The presumption in favor of the finding of a Master based on evidence and the results of actual operation under the rates in question is superior to the original presumption in favor of the reasonableness of the rate. No presumption of law arises that a freight rate is reasonable merely because such rate has been filed with the Interstate Commerce Commission, or posted in compliance with

the statutes and the mere filing of a schedule of rates raises no inference that the Commission approves them.

Connecting carriers may unite in establishing a joint through rate for the transportation of freight over their respective lines; and the fact that such connecting carriers may be regarded as competing roads does not affect this right, but where connecting carriers agree on a joint through rate, the rate so agreed on can become legally operative only by being established as prescribed by the statute. Where connecting carriers make a joint rate on interstate shipments, each carrier is brought within the scope of the Interstate Commerce Act, and rendered responsible for the rate so made without regard to the proportion thereof received for its own service.

Prior to the amendment of the Interstate Commerce Act by the Mann-Elkins Act it was settled that no power resided in either Court or Commission to compel connecting carrier to unite in a joint carriage for interstate traffic. The whole matter was left to the voluntary action of the carrier. Where no applicable through rate has been established, shipments although moving on through bills of lading take the lawful rate lawfully established on each line, unless displaced by lawful special agreement. Under the Interstate Commerce Act as amended by the Mann-Elkins Act, the Interstate Commerce Commission may establish joint classifications and joint rates as the maximum to be charged, and prescribe the division of such rates whenever the carriers themselves shall have refused or neglected to establish voluntarily such joint rates. Under the Act as amended, the Commission may regulate the allowance which trunk lines may make to tap lines.

A state statute authorizing the railroad commission to order railroads to establish through routes and empowering the commission to establish joint rates and to order that carload freight shall be carried by a different railroad without being transferred from the original car is not in violation of any Federal or state constitutional provision, and an order of the Commission establishing a joint rate for a given service and apportioning the rate between connecting carriers leaving to them the practicable way of complying with the order either by sending the loaded cars through to their destination or by transferring the load from the cars of one carrier to those of the other at the connecting point, is not invalid as beyond the power of the Commission to make.

Independently of any statutory provisions on the subject it very generally held that pooling arrangements entered into between competing railroad companies or other common carriers, the purpose of which is to suppress or limit competition between the contracting companies in respect to the traffic covered by the agreement and to establish rates without regard to their reasonableness, are against public policy and void.

In concluding this chapter on legal factors it is desired to attach particular stress to a number of conclusions which may be reached. As a result of various laws, including the Interstate Commerce Act and court decisions, as well as commission decisions, all of which may properly be included under the heading of legal factors, the following conclusions may be drawn. Rates must not be below the cost of service Cost of service, means the cost to the carrier of performing service. The cost of service to the carrier must take into consideration the carrier's investment in plant and equipment. It must also take into consideration the carriers' operating expenses. The carriers' operating expenses must be based on efficient and economical management. The general level of rates must be remunerative as well as individual rates. The general level of rates must net the carriers a fair return upon their investment in order to be remunerative. In determining the investment, consideration among other things must be given to capitalization and physical value of property devoted to transportation and to public convenience. Competition usually controls in the case of individual rates, but the effect of capitalization and valuation on rate levels is very important. Particular stress should be laid upon the fact that in granting relief from the fourth section, that is, in permitting carriers to establish rates in violation of the principle enunciated in the long and short haul clause it recognizes competition only in cases involving actual water competition or circulating rail routes. Relief from the fourth section may not be granted because of merely potential competition. The

competition must be actual. The Interstate Commerce Commission does recognize as justification for higher rates to intermediate points than to points beyond on the same route, cases where the route involved is a circuitous one, and where such circuitous routes must compete with direct lines in order to secure traffic to or from competitive points. Where actual water competition does exist the railroads are in many cases permitted to maintain higher rates to intermediate points than to points beyond on the same route. All rates must be just and reasonable. A reasonable rate is one which is just to carrier and shipper alike. The carrier is entitled to a fair return on its investment, under conditions prescribed by the Interstate Commerce Act and the Courts. The shipper is entitled to pay no more than the value of the service is reasonably worth to him. Carriers may not practice unjust discrimination in rates or service. Discrimination may be just or unjust. A discrimination in rates as between carload freight and less carload freight is justifiable, and must not be confused with unjust and unwarranted discrimination as defined in the Act to Regulate Commerce. It should finally be borne in mind that rate making has a legal and an economic aspect. The legal requirements are closely related and frequently based upon the economic conditions encountered in the movement of traffic. These economic conditions largely govern the construction and the maintenance of rates, but must always be observed within the limitations imposed by law.

The New Year at Memphis

And the Outlook in the Central States in Sand, Gravel, Clay and Cement Fields. Production Figures

By Our Memphis Correspondent

JANUARY OPENED with a continuation of bad weather and decided prospects of snow, though the first month of the winter passed without snow but with three recurrent cold snaps, each one more intense than the last. This cold spell, however, was accompanied with frozen ice in the river a distance of thirty miles below Memphis, greatly impeding traffic up to January 1, when it was somewhat dispersed.

Trade conditions have been very healthy. The building figures at Memphis will go a little above $20,000,000 for the year. Nashville, Dallas and other cities also make a fine showing. For the present the annexation of the east suburbs of Memphis have been abandoned, but encouraging news comes of the early building of the viaduct on the Arkansas terminus of the Harahan bridge. This will be discussed at a meeting in Memphis the first Saturday in January by three interests, the city of Memphis, the states of Tennessee and Arkansas and the government will have a hand in the enterprise which is a million dollar proposition. The approaches on the Memphis side over the railway tracks will probably be constructed anew through Carolina and Iowa streets, from Main street, making a vastly better approach. The viaduct will be of concrete, thirty feet wide, walks on either side of the vehicle and steam track roads, protective concrete and steel walls on the side of these and water ducts beneath to take care of overflows, etc.

Out-of-door operations the last fortnight at gravel and sand pits and shipments, too, have been much disturbed by wintry conditions, but inquiries and demand are good, contractors, architects and engineers being quite busy right at the entrance of the new year. The early new year road and cement meetings in Chicago will be attended by several of the trade from the Memphis section.

The biennial session of the Tennessee legislature starts at Nashville January 5, and continues for seventy-five days with one recess. Road projects, park projects and internal improvements will be considered from many angles.

While the Tennessee Highway Commission let a great many road contracts in 1924, there will be a further letting at Nashville, January 23, some seventy-five miles in portions of the following counties; Meigs, Carter, in East Tennessee; Cannon, Rutherford, Pickett, Wayne, Hardin, Robertson and Jackson in middle Tennessee, Henry in West Tennessee. Several of these counties are in the Cumberland mountains of Middle Tennessee. Hardin is partly in middle Tennessee and partly in West Tennessee along the Tennessee river. It is the site of the Shiloh National Park. The legislature will consider during its session a park improvement

in East Tennessee in the counties of Sevier and Blount.

Around the city of Nashville several bridges over leading turnpikes are to be erected in 1925, contracts let. Numerous large constructive jobs are to start, one five-story office building and another $800,000 office building. Two large hotels are to be finished at Nashville early in the year and the Tennessee War Memorial and Capital Annex by A. J. Krebs and Co., about May, 1925, the latter at a total cost of $2,000,000 including site.

The Hermitage Portland Cement Company at Nashville completed about a year ago is turning out more than 8,800 sacks per day, and this output is to be increased soon.

It is announced the town of Corinth, Mississippi, Alcorn county, which suffered a million and a half fire loss Sunday December 28, will be built in the main. Fifty establishments were wiped out by this disastrous fire including the post office, a large bank and many commercial enterprises.

Jackson, Hinds County, Mississippi, is planning a large amount of paving work for the 1925 season. The Holly Springs section of Marshall County, Mississippi, is developing some good clay pit interests. The Pollard Clay Company Exchange Building, Memphis, is active in that field. The Johnson-Porter Clay Company at McKenzie, Tennessee, is active in Henry and Carroll Counties.

Several road building projects are under way near Natchez, Mississippi, to the Louisiana state line. Some good sand beds have been discovered in the Nonconnah Creek section just south of Memphis. Gravel of good quality has been found in the creek, and some pumping machinery has been installed there.

The Camden Gravel Company Cotton Exchange Building, Memphis, reports its pits in Benton county operating part time and the new year road building program in neighboring sections encouraging. The Memphis Stone and Gravel Company, 1630-33 Exchange building, C. D. Smith manager is, shipping from its several pits in Mississippi, Tennessee and Kentucky to railroads.

The Illinois Central R. R. has acquired by lease some new mileage in Mississippi between Meridian and Shreveport and is doing a good deal of improvement work in this section of the South. The Louisville and Nashville Railroad early in 1925 is making large additions at its Leewood yards northeast of Memphis a few miles.

Powell-Graham Company, 2738 Broad street, Memphis, are in their material department featuring products of the Raleigh Sand and Gravel Company. The Wolf River Sand Company at Memphis, is active in the building material trade.

Prominent Sand and Gravel Producer Dies

LOUIS LAUN, a pioneer in the development of the Good Roads Industry of Wisconsin, and an outstanding figure in the commercial life of the state, died at his home in Elkhart Lake, Wisconsin, December 25, 1924. Mr. Laun was born in the Town of Rhine on August 15, 1865. He attended school in Dodgeville, Wisconsin, and, also, attended Mission House College at Franklin, Wisconsin.

As President of the Wisconsin Rapids Sand and Gravel Company, and Secretary and Treasurer of the Elkhart Sand and Gravel Company, he became well known for his efficiency as a designer and manager of model sand and gravel plants.

Mr. Louis Laun attended the meeting of the Wisconsin Mineral Aggregate Association held just a week prior to his death and was re-elected for the sixth time as a director of that body.

Mr. Laun was connected with many concerns. He was President of the Bank of Elkhart Lake; President of the Kiel Furniture Company of Milwaukee and Kiel; Secretary-Treasurer of the Elkhart Lake Realty Company, and President of the Quit-Qui-Oc Golf Club.

He was also an extensive traveler, having visited practically every state in the Union. He was well known in social circles and a Member of the Quit-Qui-Oc Golf Club; Lodge 57 Benevolent Protective Order of Elks; Chamber of Commerce of Milwaukee; the Hoo-Hoo's fraternal Lumbermen's Association; Modern Woodmen of America, and Engineering Society of Wisconsin.

Deceased is survived by his wife at Elkhart Lake; daughter, Mrs. Harry M. Swartz of Berkeley, California. Three sons, Harold, a student of the University of California at Berkeley; Arthur H. Laun of Milwaukee, and Lester L. Laun of Elkhart Lake.

Thogmartin and Gardiner Producing River Sand and Gravel

Small Modern Plant at Iola, Kansas, with Good Record Deposit Consisting of 700 Acres Along the Neosho River

ALMOST all of the gravel used in and around Iola, Kansas, was shipped in from other localities until the latter part of 1923. There was a large deposit just outside of Iola, but it was not considered good enough to be used. This situation was changed, however, when Thogmartin and Gardiner, prominent contractors of southeastern Kansas, proved that the deposit could be utilized successfully. They built a plant on this site and have been busy ever since.

Thogmartin Dragline Operation in Perspective.

The office of Thogmartin and Gardiner is at Fort Scott, Kansas, and the gravel plant at Iola is managed and operated by A. B. Gilfillan and A. C. Maddux. It was Mr. Maddux who first realized the value of this gravel supply. At first he worked the pit with teams but later succeeded in interesting the firm of contractors in the project. A modern plant was erected in order to work the pit efficiently. At the present time material is taken from the pit with a 13 cubic foot Sauerman "Junior" cableway and is prepared for use by a washing and screening plant.

The deposit here is a vein of some 15 to 20 feet of depth with an average overburden of 5 feet. The gravel is cemented with a clayey soil which makes it somewhat hard digging. The light Sauerman "Junior" cableway is designed and recommended for pits where the material is loose and easily dug, and the success of the small machine in this pit is interesting. The bucket is doing excellent work with a daily capacity varying from 150 to 200 cubic yards and averaging nearly 200 cubic yards.

Compared with the small excavating unit the rotary screen and sand settling tank used at this plant are rather large, but the material is

View of Thogmartin Tipple and Dragline in Action

exceedingly hard to wash and part of it is washed and screened a second time. Material which is not cleaned by one washing is spouted to the ground and lifted back to the top of the plant by a bucket elevator. The product is thus thoroughly cleaned before it leaves the plant. The screening and washing plant is Telsmith equipment furnished by Smith Engineering Works.

Three separations are made by the screens, one size being sand and two gravel. These three grades are distributed into their respective bins, each bin having a storage capacity of approximately one carload. Two Byers cranes with clamshell buckets are used for reclaiming, loading, etc.

From the beginning the Thogmartin and Gardiner plant has been a success. Its record during the winter of 1923-1924 has been continuous operation with scarcely the loss of a day, and this same record has been kept up since the plant started operation in September, 1923. The demand for washed and screened gravel in the vicinity of Iola warrants the prophecy that this plant will be kept just as busy for a long time to come.

New Slag Crushing Plant Contemplated

The Emanuel Slag Company, Inc., with plants at Easton and Catasauqua, Pa., main office, Allentown, are preparing plans for the construction of another plant to be constructed as soon as plans are completed and will be located on one of the largest Slag banks in the Lehigh Valley, half way between Allentown and Catasauqua. The largest markets in this section will be reached from this plant over the Philadelphia & Reading R. R. and Central Railroad of New Jersey. The product from this plant will be the very best dense Slag suitable for road building and the best concrete construction work. The plant will have a capacity of 1,000 to 1,200 tons daily.

Paxon Issues Circular

A folder illustrating and describing The Paxson Cloth Screen Dust Collector has just been issued by the J. W. Paxson Co., Philadelphia, Pa.

This is a practical device for improving sanitary conditions and the working efficiency in any plant handling dry granular material by removing 98 per cent of the fine powder and dust in the air. It also salvages this material, eliminating one channel of waste.

Southern Illinois Limestone Company Builds Crushing Plant

Quarry Located Adjacent to Railroad and on Ohio River Deposit Rises Abruptly 150 Feet Above Level of Railroad

NATURAL advantages with regard to location and quality of rock available were largely responsible for the Southern Illinois Limestone Company's selecting the site of its crushed stone plant which was completed late last fall. Then too, Mr. W. W. Grant, the president of the company has long been an advocate of good roads. During the state political campaign of 1924 he engaged in an extensive speaking tour as a candidate for the state legislature of Illinois on a good roads platform. The efforts of Mr. Grant and many others resulted in Illinois' authorizing a $100,000,000 bond issue for road building during 1925 by an overwhelming majority. This road program will afford increased activity for the crushed stone business in Illinois. Incidentally it will introduce several new plants to the industry.

The Southern Illinois Limestone Company leased 53 acres of land at Shetlerville, Illinois, during June, 1924. This site is on the Illinois Central Railroad seven miles north of Golconda and seven miles south of Rosiclare. The new plant is only 800 feet from the Ohio River which affords water transportation. The deposit rises abruptly 150 feet above the level of the railroad track. The crushed stone can be conveyed by gravity to the river. This rise of 150 feet above the level of the railroad made it quite a task to clear away the bluff in order to lay in a siding.

The deposit is a solid limestone of very high quality and practically without any overburden of any sort. These natural advantages together with the fact that there was an immediate market for the material produced were largely responsible for the building of this plant. Mr. Grant and his associates firmly believe that engineering principles applied to the crushed stone business will result in low costs and a quality product. Service is also to play an important part in the company's operations. The intentions are to prepare material largely for road building.

Mr. Grant

The sales and business plant of this organization are sound. They will aim to prepare material for that market for which their product is best suited instead of attempting to serve all markets. In sales activity the quality of their material will be stressed. The Southern Illinois Limestone Company will have its own specifications for its material.

The ground for the new plant was broken on June 18, 1924. Being seven miles from any source of supplies they found that progress was not as rapid as they desired. All the roads in this vicinity are also in bad condition. An office and quarters for the men were first built on the top of the bluff 150 feet from the level of the track. The plans called for crushing stone by October 1, 1924, but due to numerous delays crushing did not begin until late in the month of October.

The stone is crushed in a number 7½ Austin crusher. From this crusher the material passes to a 40 foot rotary Good Roads Machinery Company screen. All conveying of material is by belt conveyors and elevators of Gruendler manufacture. The present capacity of the storage bins is 600 tons. These bins are equipped with Austin bin gates. An Anderson 110 H.P. oil engine furnishes the power. A smaller crusher will be installed this spring to recrush the tailings and to provide a greater quantity of fine material. Steel bards were placed in the crusher last fall to reduce the size of material.

By early spring it is expected that this plant will produce 500 tons in

nine hours. The plant is now being equipped to run two shifts. The quarry will be ideal when it is a little further developed. The quarry face will be a quarter of a mile long with an average face fifty feet in height. The quarry floor is level with the crusher. The rip rap floor is level with the top of a railroad car. This saves elevating any of the stone to the crusher or to the railroad cars.

There is probably no industry in which the continued existence of the small producer is more easily assured than in the crushed stone industry. The Southern Illinois Limestone Company is protected by the very freight rates that restrict its own market.

This plant is flexible in every detail. This is opportunity for improvement as the market develops by altering or adding to the present equipment. In the case of this plant this will not necessitate the expenditure of a large sum of money. The crusher in use is large enough to practically eliminate secondary shooting and their quarry costs are kept to a minimum. With the addition of another smaller crusher the production can be considerably increased.

The Southern Illinois Limestone Company are in the transition stage at this time. Growth will involve the addition of more equipment and the developing of a comprehensive sales plan. The officers of the company are W. A. Grant, president; J. H. Woolcott, vice-president; John B. Lee, treasurer; A. P. Dorris, secretary; and J. W. Dreisbach, superintendent. These five men constitute the board of directors. The plant will be equipped to produce the various sizes of road aggregate and also agricultural stone. The agricultural stone market in the Southern Illinois territory is developing rapidly.

The Jackson Pike Sand and Gravel Co., Columbus, O., has been incorporated for $100,000, by James F. Baird.

The Wenonah Cement Products Co., 428 Market Street, Camden, N. J.. has been incorporated for $200,000 to manufacture cement products.

Universal Crane Company, Elyria, Ohio, has appointed A. E. Ensell, 1628 Market street, Philadelphia, to care for its customers in that city and neighboring territory.

New Incorporations

The Yosemite Portland Cement Corporation was recently incorporated to manufacture and deal in portland cement. Capital $1,650,000. Incorporated by Samuel C. Wood, New York.

State Gravel Company, Tacoma, Wash., has been incorporated for $100,000 by W. R. Nichols, H. K. Nichols and Scott Z. Henderson.

Walton Concrete Company, Manhattan, N. Y., has recently been incorporated for $5,000 by R. Epstein, R. Manson, and E. Ellison. (Attorney, C. E. Benoit, 297 4th Avenue, N. Y. C.)

Cambridge Sand and Gravel Company, Boston, Mass., has been incorporated for $500,000 by A. Muriel Rider of Danvers, Max L. Sand of Boston, and G. Duthie-Strachan of Chestnut Hill.

Shawnee Stone Company, Wilmington, Del., was recently incorporated for $100,000 to quarry, buy, sell, fabricate and erect stone.

National Sand and Gravel Company, Trenton, N. J., has been incorporated for $50,000 by Julia Steward.

Mid-West Sand and Gravel Company, South Bend, Ind., has been recently incorporated for $50,000. Directors, F. E. McDonald, Howard Edwards, Lee H. Mattes, A. N. Hildebrand.

Hamburg Ridge Lime Company, Dover, Del., has been incorporated for $100,000 by Cooper and Cooper.

Stewart Sand and Gravel Corporation, Binghamton, N. Y., has been incorporated with 1,500 shares preferred stock, $100 each; 1,500 common, no par value by C. R. and M. R. Stewart, H. J. Lampheri. (Attorneys, Stewart, Moody and Chamberlain, Binghamton.)

The American Silica Company of Rogers, Ark., capital $50,000, filed an application with the Arkansas Railroad Commission to sell $15,000 common stock. Charles Baldwin of Rogers is president and S. G. Parsley is secretary, also of Rogers.

Financial Basis of State Highway Programs

By HENRY R. TRUMBOWER*

So far as it can be determined, the annual highway bill of the country amounts to about a billion dollars at the present time. This estimate is based on a very comprehensive and complete survey of the expenditures for rural highways and the income to meet these expenditures for the year 1921, conducted by the United States Bureau of Public Roads. These figures cover the expenditures made for this purpose by the states, counties, townships, and various road districts. In 1921 the total expenditures for rural highway purposes amounted to $1,036,587,772. So far as any data and information can be gathered the expenditures for the years subsequent to 1921 were just about the same, upon which fact the statement is based that the annual highway budget is approximately a billion dollars a year.

The total expenditure in 1921 has been classified as to the various uses toward which this money was put. The construtcion expense item was 60.5 per cent of the total; maintenance, 24 per cent; the payments made on account of interest on bonds and bond retirements, 8.6 per cent; administration and engineering expenses, 3.5 per cent; and general miscellaneous expenses, 3.4 per cent. It is evident that the major part of the highway expenditure was devoted to construction. It is quite probable that certain expenses were called construction expenses which, in fact, should have been classified as maintenance expenses. On the other hand, it is also highly probable that construction expenses were incurred and charged to maintenance which, in fact, should have been charged to construction. Such errors and deviations from scientific accounting tend to compensate each other, so that we can say that the construction expense involves practically 60 per cent of the total expenditures and the maintenance expense about 25 per cent of the total.

The expenditures for rural highway purposes vary a great deal in the different sections of the country when compared on a per mile basis. When this total expenditure is applied to the 2,941,294 miles of highway in the United States, it results in an average expenditure per mile of $352. There are four states, namely, Alabama, Nevada, New Mexico, and North Dakota, in which the average expenditure per mile is less than $100. In fourteen states the expenditure per mile ranges between $100 and $249. These states are Colorado, Georgia, Kansas, Kentucky, Missouri, Montana, Nebraska, Oklahoma, South Carolina, South Dakota, Tennessee, Utah, Vermont and Wyoming. In fourteen states the average expenditure per mile is between $250 and $499. These states are Arkansas, Florida, Idaho, Illinois, Iowa, Louisiana, Maine, Minnesota Mississippi, New Hampshire, North Carolina, Texas, Virginia and West Virginia. In ten of the states the average expenditure per mile ranges between $500 and $749. These states are Arizona, California, Connecticut, Indiana, Maryland, Michigan, New York, Oregon Washington and Wisconsin. In two states the average is between $750 and $999. These are Ohio and Pennsylvania; and in four states the average expenditure per mile on the highways amounts to $1,000 and over. These are Delaware, Massachusetts, New Jersey and Rhode Island.

The largest expenditures per mile of highway are noted in the eastern and more populous states of the country. Among those states which spend over $500 per mile on the highways, there are only four west of the Mississippi River. These are Washington, Oregon, California and Arizona.

After having set forth the total expenditures on our rural highways, it next becomes important to make an analysis of the different sources from which the funds are derived to meet this expenditure. As indicated before, the 1921 survey showed in great detail how and in what manner the money was raised for this purpose. The total income from that year for all rural road purposes was $1,149,-

*Economist, U. S. Bureau of Public Roads. Digest of an address before the American Road Builders' Association Convention at Chicago, Ill., January 6, 1925.

437,896. This income was divided as follows: Bonds, 38.1 per cent; general property tax, 36.2 per cent; motor vehicle revenues 10.6 per cent; federal aid, 6.9 per cent; and all other sources, 8.2 per cent.

In this last item are included special appropriations and transfers from other funds and various other small items, so that it may be generally regarded that this money was also raised from taxation of one kind or another.

As will be shown later on, the amount of revenue derived from the motor vehicle has been increasing very fast in the last few years so that the ratio of this item to the total is also very much greater than it was in 1921. To what extent there has been a reduction in the other items has not yet been determined but it is believed that the amounts derived from bonds and from taxes have been decreased in consequence of the large sums derived from motor vehicle license fees and gasoline taxes.

The ratios of these different amounts derived from these various sources as compared with the total income, differ very materially so far as different sections of the country are concerned. While it appears that approximately 38 per cent of the total highway income for 1921 was derived from bonds, it is noted that in the New England states only 12.7 per cent was derived from this source, while in the western south central states 59.3 per cent came from the sale of bonds. The lowest percentage raised from taxes is found in the west south central states, where the general property tax contributions amounted to only 22.8 per cent; and in the west north central states the general property tax contributions were 48.5 per cent.

While the money derived from bonds was only a small proportion of the total income for highway purposes in the New England states, it is noted that in these states over 25 per cent of the highway income in that year was derived from the motor vehicle. In the west south central states only 5.4 per cent came from motor vehicle license fees and gasoline taxes. It is evident in studying the trend of motor vehicle revenues for the last few years, that this per cent has been very materially increased in all of the sections of the country.

In 1921 there was only one state, North Dakota, which did not derive any part of its highway revenue from the sale of either state or local bonds. All the other states derived a part of their highway revenues from this source. Six of the states received less than 10 per cent of their highway revenues from the sale of bonds. These states were New Hampshire, Vermont, Rhode Island, Connecticut, Kentucky and Colorado. Eleven states derived between 10 and 24 per cent of their highway revenues from bond sales, namely, Maine, Massachusetts, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Nebraska, Wyoming, New Mexico and Washington. Nineteen states received between 25 and 49 per cent of their total highway income from the sale of bonds, namely, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Kansas, Maryland, Virginia, Georgia, Alabama, Oklahoma, Montana, Idaho, Utah, Nevada, Oregon, and California.

There are eleven states which depended on bond issues to the extent of 50 per cent and more of highway revenues. These states were Delaware, West Virginia, North Carolina, South Carolina, Florida, Tennessee, Mississippi, Arkansas, Louisiana, Texas and Arizona. Those states which appeared to depend more upon bond issues than upon any other source of revenue for meeting their highway expenditures were largely in the southern part of the country. As a matter of fact, none of these which raised 50 per cent and more of their highway revenues from bond issues were in the section of the country north of the Ohio River, and only four of them, namely, Arizona, Texas, Arkansas and Louisiana were west of the Mississippi River. In that group which depended upon bonds for 25 per cent and less of their highway revenues are included all of the New England states and those states generally spoken of as the middle west.

The bonds which have been issued for highway purposes and were outstanding at the end of 1921 are divided into two classes: those bonds issued by state governments, and those bonds issued by local governmental units such as counties townships, and road districts. At that time there were outstanding bonds to the amount of $1,222,312,300. Only 28 per cent of these outstanding bonds were issued by state governments, and 72 per cent were issued by local governmental units. Over half of the states,

twenty-seven in number, have no state highway bonds outstanding.

In discussing the total indebtedness of the country great emphasis is being placed upon this highway debt, as if it constituted the principal indebtedness of the country outside of the debt incurred by the federal government. The total indebtedness, including local and state, in 1922 was $8,695,906,000. Of this amount the local indebtedness was $7,759,492,000, of which only 11 per cent was created for highway purposes and 89 per cent was for other purposes. The state indebtedness of the country was $936,414,000, of which only 37 per cent was for highway purposes, the remaining 63 per cent consisting of bonds which were sold to meet other state expenditures.

One of the interesting aspects of this whole subject of highway finance is the movement in these last few years to collect larger sums of revenue from the user of the road, namely, the motor vehicle. These collections are made through the charging of license fees and the enactment of gasoline tax laws. Comparisons are made by states for the years 1921, 1922 and 1923 showing the total highway expenditures for those years and the total revenues derived from motor vehicle license fees and from the gasoline taxes. In order that we may have comparable bases, the highway expenditure items mentioned here do not include any interest and principal payments. The comparison is made wholly as between what was spent for these given years on the highways and what ratio the license fees and the gasoline taxes collected bear to such expenditures. In 1921 the license fees and gasoline taxes for the country as a whole averaged 13.4 per cent of the highway expenditures; in 1922 they averaged 17.2 per cent; and in 1923, 24.2 per cent. So far as can be ascertained, we are justified in estimating that in 1924 the license fees and gasoline taxes paid in the United States amounted to approximately one-third of the total money spent on the maintenance and construction of all of the country's highways.

Different conditions are observed in the various states. In 1923, for example, there were five states,—Massachusetts, Vermont, Connecticut, Maryland and Rhode Island,—in which the motor vehicle revenues were more than 50 per cent of the total highway expenditures, and in Massachusetts they amounted to 64.5 per cent, the highest in any one state. In that same year there were five states,—Arizona, Mississippi, New Mexico, Texas and Wisconsin,—in which the ratios between motor vehicle revenues and highway expenditures were less than 12 per cent. In Arizona, where they were the lowest, they amounted to 7.9 per cent. An examination of these percentages shows that the tendency to raise a larger proportion of the highway expenditures from the user of the automobile was very marked in this period. In 1921 there were only six states,—Connecticut, Maryland, Massachusetts, Nebraska, Rhode Island and Vermont,—in which the motor vehicle revenues equaled or exceeded 25 per cent of the highway expenditures.

It is interesting to observe, after having established the relationship between motor vehicle revenues and highway expenditures in the several states, in what manner and by what methods these motor vehicle revenues are raised. For the years 1921 and 1923, a division has been made as between license fees on the one hand, and gasoline taxes on the other. In 1921 the fees for licenses and permits collected by the several states amounted to $122,269,071, covering a total registration of 10,422,670 motor vehicles. This resulted in an average payment of $11.70 per vehicle. In 1923, the last year for which full and complete data are available the total license fees and permits amounted to $188,970,992, covering a registration of 15,092,177 motor vehicles, resulting in an average of $12.52 per vehicle.

In 1921 there were three states in which the average revenues derived from motor vehicles were $20 and over, and in 1923 there were twenty states in this class. In 1921 there were thirty-four states in which the average motor vehicle revenues were $10 to $19; in 1923, twenty-eight states. In 1921 there were eleven states which collected $10 and less as an average from the motor vehicles, and in 1923 there were only five states in this class. This shows that the motor vehicle revenues were not only increased because of the increase in the number registered, but the revenues from this source were also augmented by the increase in the average license fees.

In most of the states the largest part of these motor vehicle revenues

is derived from the license fee, and the gasoline tax is regarded as a contributing element. In those states which had a gasoline tax in effect in 1923, 74 per cent of the total vehicle revenues came from the license fees, and 26 per cent from the gasoline tax. Oregon, which in 1923 derived $36.32 as an average from each motor vehicle collected $24.52 or 67 per cent of the revenues, in the shape of license fees, and $11.80, or 33 per cent of the total motor vehicle revenues, as a gasoline tax. It should be stated that Oregon and a considerable number of other states exempt the motor vehicle from the personal property tax, which accounts to a certain extent for the rather high license fees. It is only natural to expect that, in those states where 3-cent gasoline taxes prevail, the gasoline tax revenues form a very large part of the total motor vehicle revenues. In South Carolina, for example, in 1923 the average motor vehicle revenues were $18.94 per registered car. Of this amount $7.08 was collected as a license fee, or 37 per cent of the total; and $11.86 was collected as the average gasoline tax, or 63 per cent of the total.

At the present time there are thirty-five states which are collecting a gasoline tax. The rates range from 1 cent to 4 cents per gallon. It is rather interesting to note, in examining a map of the country showing the different rates in effect, that those states which do not collect a gasoline tax are practically all in the northern Mis sissippi Valley with the exception of New York, Massachusetts, Rhode Island and New Jersey. The states which charge the higher rates are found for the most part in the southeast part of the country, with Oregon, Arizona and Arkansas constituting exceptions.

The latest gasoline consumption and tax data are for the six-month period ending July 1, 1924. An examination of the rates for that six-month period show that $4.18 was the average collection per car in those states which had the tax, and that the average gasoline consumption in those states was 211.5 gallons. Using this as a basis for estimating, it is predicted that the total 1924 consumption averaged more than twice this amount. Four hundred and fifty gallons appears to be a reasonable figure. The gasoline consumption per car was naturally very much greater in those states in which severe winter and weather conditions did not interfere with automobile operation. In Florida, for instance, the average consumption per car in this six-month period was 373 gallons, and in North Dakota it was only 90 gallons.

A study has also been made as to the gasoline consumption per car under various gasoline tax rates. Only five states could be studied, because these were the only states in which there was a rate charged and in which uniform rates existed for a whole six-month period. The periods compared are the first six months of 1923 and the first six months of 1924. In each of the states,—South Dakota, Pennsylvania, Washington, Georgia and Florida,—there was an increase in the rate of gasoline tax in the 1924 period as compared with the 1923 period; and in each of these states it was shown that the average consumption per car was greater under the increased tax rate than in the similar six-month period, when a lower tax rate prevailed. No cognizance, however, in making this study is taken of changes in the price of gasoline, which naturally may have had an important effect.

In discussing this whole subject of motor vehicle revenues, it is necessary to distinguish between the average passenger car license fees that are paid and the average motor truck license fees. Only twenty-eight states which have made reports separate the passenger car license fees and motor truck license fees, as well as the two classes of registrations. In 1924 for the first six-month period the average passenger car license fees ranged from $3.17 in California to $28.20 in Idaho. The average for the states was $10.70. The average motor truck license fees for these same states was $21.90, or over twice as much as the average passenger car license fee. The lowest motor truck license fee was found in Montana, where the average motor truck was charged only $11.60; and the highest in Oregon where the average was $51.80.

In 1923, 81 per cent of the $188,613,054 was used for highway by and under the direction of the state highway departments, and only 58 per cent of the $36,813,924 collected as gasoline taxes was spent under the direction or by the state highway departments. In other words, there was much more of a tendency to turn back to local units a part of the gasoline

taxes than there was in the case of motor vehicle license fees.

A study of highway expenditures would not be complete unless we took into account the ability of the people as a whole to meet this kind of expenditure. For this purpose a comparison has been made between the per capita income of the people of the country and the per capita highway expenditures. This has been analyzed by states. For the country as a whole in 1921 the per capita highway expenditures, exclusive of interest and principal payments, were $9.00, and this amounted to 1.13 per cent of the per capita income for that year. In other words, the people of the country are spending each year for highway construction and maintenance just a little more than 1 cent out of every dollar which they take in.

In thirteen of the states,—Alabama, California, Connecticut, Illinois, Maryland, Massachusetts, Missouri, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont,—the per capita highway expenditures amounted to less than 1 per cent of each person's income. In seventeen of the states,—Colorado, Florida, Georgia, Kentucky, Louisiana, Maine, Michigan, Nebraska, New Mexico, Ohio, Oklahoma, Tennessee, Texas, Utah, Virginia, Washington and West Virginia—the highway expenditures were between 1 and 2 per cent of the per capita income. In eleven of the states,—Delaware, Indiana, Kansas, Minnesota, Montana, Nevada, North Carolina, North Dakota, South Carolina, Wisconsin and Wyoming—the highway expenditures were between 2 and 3 per cent of the per capita income; and in seven states,—Arizona, Arkansas, Idaho, Iowa, Mississippi, Oregon and South Dakota,—they were over 3 per cent. South Dakota showed the highest ratio, where the highway expenditures amounted to 6.84 per cent of the people's income. In New York the lowest ratio was found, where the highway expenditures were only 3.4 per cent of the per capita income.

In general it may be said that, where the per capita highway expenditures are large, in those states the ratio between such expenditures and the people's income tends to be high. In states where there are large cities the per capita expenditures tend to be less and at the same time the per capita income is larger than in the states where the rural population dominate. In the New England and middle Atlantic states the per capita expenditures for highway work averaged .55 per cent of the per capita income in those states; in all of the other sections of the country they were over 1 per cent; and in the west north central and the mountain states they were over 2 per cent. These higher percentages are accounted for by small populations bearing the costs of extended highway improvements with relatively small incomes per capita.

Simplicity Screens

Bulletin No. 20 and *Bulletin No. 30* on the Oilless Simplicity Screen, Number Three, and the Junior Simplicity Screen, Oilless, have just been issued by the Simplicity Engineering Co., Engineers, and Manufacturers of Gladwin, Mich.

The Oilless Simplicity Screen, No. Three, is a portable screen of large capacity, for all screenable materials, wet, damp or dry. The vibrators and bearings require oiling and adjustment but once a year and are said to be mechanically perfect.

The Junior Oilless Simplicity Screen is a small portable screen of large capacity for all screenable materials, wet, damp or dry. It also is of the vibrating and shaker type, both the oversize and sand screen being vibrated both horizontally and vertically. The machine is of iron and steel throughout, simple and practical in design and complete in itself with power plant. Vibrators and bearings require oiling but once a year. A number of illustrations show the machine in detail and at work.

Byers "Rear Cat" Crane

A new handsomely illustrated book in two colors has been issued by The Byers Machine Company of Ravenna, Ohio, describing Byers "Bear Cat" 25, The All-Purpose Light Crane.

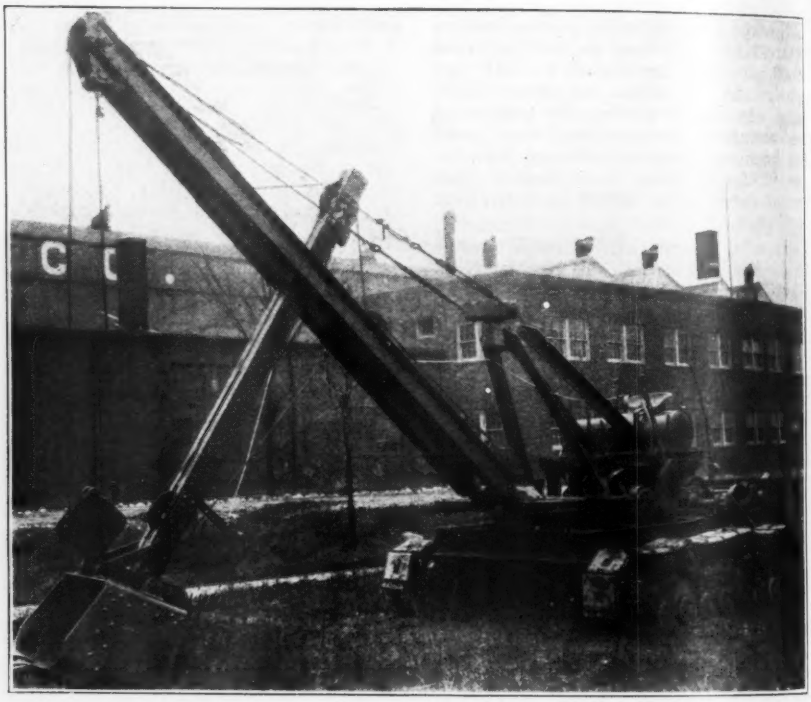
This crane is said, by its makers, to be marked by its ability to do many jobs and do them well, and for its speed in operation, its toughness and gameness for any work.

The "Bear Cat" is compact, powerful, easy to move and operate, and handles a complete range of interchangeable attachments giving it the versatility which appeals to so many users. Many fine views are included showing the machine in action on various types of work.

The 1925 Insley Excavator

The Insley Excavator for 1925, with shovel, ditcher or crane attachments is especially interesting to owners and operators of sand and gravel pits, and to quarry operators who have a fair amount of stripping to do. Some of the best records made by these machines in 1924 were made in dry sand and gravel pits, where they effected a considerable saving for their owners. The shovel has a bucket with ⅓ cubic yard capacity, and can handle from 300 to 500 cubic yards of material a day with ease. The ditcher attachment is readily interchangeable with the shovel, and is useful for any type of digging below grade, and therefore especially adapted for stripping where the overburden does not exceed ten feet. The crane attachment will handle 3,000 pounds on a single line at an 18 foot radius, or a half yard clamshell, and is useful for handling material in cars.

Believing that the same advantageous features which appear on large power shovels are desirable on smaller machines, the manufacturers have provided full crawler traction, together with other mechanical features, which increase its power and flexibility. The crawler shoes are 13 inches in width, the crawler bearing surface for each side being 102 inches by 13 inches. The width of the machine is 8 feet 6 inches out to out of crawlers, making the use of outriggers unnecessary. The crawlers are chain driven, and each one can be operated independently. The machine can be turned completely around in an 18 foot circle.



The 1925 Insley Excavator

The new Insley is provided with a 4 cylinder 4x5¼ inches type K. T. U. Buda Engine. An Eiseman magneto with impluse starter is used; and a Zenith carburetor with a United air cleaner. The engine is governed at 1,200 R.P.M. Roller and ball bearings are used throughout with the exception of drums, which are bronze bushed, and crawler sprocket bearings, which are babbitted. All bearings are fitted for pressure lubrication and cut gears are used exclusively.

The Insley Manufacturing Company have perfected, in their excavator, a

machine for which there has long been a place in the construction field, to handle that class of work which is not large enough to warrant investment in expensive excavating machinery. It is of low first cost, and being a fast worker and controlled entirely by one man, it is very economical in operation.

Hoar Revolving Shovel

The New Model Hoar Shovel

TO MEET the growing demand for a full revolving power shovel of a size suitable for use in restricted quarters, the Hoar Shovel Company of Duluth, Minn., has placed on the market a new gasoline, or electric, crawler type shovel.

For seven years the Hoar Shovel Company has manufactured underground power shovels, which are now in general use throughout the mining fields, and in the construction of power, water supply and railway tunnels.

The new model of shovel now offered is designed for surface work. The same leverage principle used on the underground shovel is incorporated in the surface machine. This leverage principle gives enormous power for digging, and permits of heavy work in a limited space.

The manufacturer has followed out the best methods of construction, producing a strong sturdy machine designed for the heaviest duty. Construction throughout is of steel castings. Parts subjected to digging strains are of special alloy steel. Gears are all cut steel, the ones subjected to heaviest duty being heat treated.

The sand and quarry operators have for some time felt the need of a power shovel which could be used in small quarters, easily moved, and capable of producing a satisfactory tonnage. The New Model Hoar Gasoline or Electric Shovel combines these features, at a reasonable investment cost. Operators interested in this type of equipment should get in touch with the Hoar Shovel Company, Duluth, Minn., for full specifications and operating data.

Pioneer Bucket Company Issues Folder

The Pioneer Bucket Company, 1013 Fletcher Savings and Trust building, Indianapolis, Ind., in a new folder describes the Pioneer back-dump slack line bucket. One illustration shows three Pioneer outfits on one contract. The Pioneer, it is said, has kept ahead of the times. Simple to erect and operate. Slack line excavation is a special branch of engineering that has been developed during the last 10 or 15 years, resulting from the need of a cheap method of excavating material over a large area and storing same in bins ready to be loaded by gravity into cars or trucks. Pioneer buckets are built in different sizes to suit customers' requirements. Illustrations show this equipment in operation on a variety of jobs.

National Lime Bulletin

The Binder In Your Wall is the title of the latest bulletin issued by the National Lime Association, a pocket-size guide for Architects and Constructors.

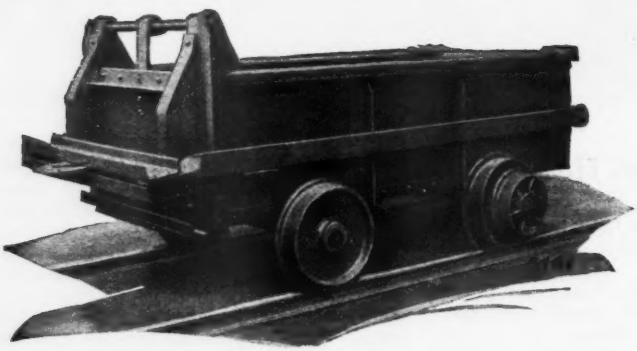
This bulletin presents in a compact, handy and easily read form a summary of the latest information on lime mortar. It is well illustrated and contains material of interest to all who build with brick or stone. The contractor will welcome the handy tables and the architect will be interested in the short form specification clauses, suitable for direct incorporation in his master sheets. Copies may be had on request from the National Lime Association, 918 G Street, N. W., Washington, D. C., the Division offices, or any member of the Association.

Telsmith Washing Plants

Telsmith Bulletin No. 268A, describing Telsmith Gravel Washing Plant Layouts, has just been issued by the Smith Engineering Works. This book contains eleven typical drawings, showing plants ranging in capacity from 25 yards an hour up to 150 cubic yards an hour. Most of the drawings are new and were prepared especially for this book. Only four have already been published.

With each drawing is included a list of equipment and a very full discussion as to possible improvements and a variation from the layout as shown.

EASTON QUARRY CARS



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Easton Car & Construction Co.

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